



Xstrata Coal NSW

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## BULGA COAL COMPLEX

### Annual Environmental Management Report 2010

**June 2011**

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XCN06 – 025



**GSS ENVIRONMENTAL**  
Environmental, Land and Project  
Management Consultants

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## 1.0 INTRODUCTION

The Bulga Coal Complex is approximately 12 kilometres (km) southwest of Singleton, and approximately 2km from the townships of Broke and Bulga, in the Upper Hunter Valley of New South Wales (NSW) (refer to **Figure 1.1**).

The Bulga Coal Complex comprises of two coal mining operations, being the Bulga Surface Operations, which incorporates the Bulga Coal Complex Coal Handling and Preparation Plant (CHPP), and Beltana Underground Operations. The CHPP and the rail loading facility, located in the north-east corner of the Bulga Coal Complex (refer to **Figure 1.2**), services both operations. Bulga Coal Complex is managed by Bulga Coal Management Pty Limited (BCM) on behalf of the Bulga Joint Venture. Each mining operation is managed as a separate business unit of the Bulga Joint Venture.

Throughout this Annual Environmental Management Report (AEMR), the surface operations will be referred to as the **Bulga Surface Operations**. The Beltana No. 1 Mine combined with the Blakefield South mine will be referred to collectively as the **Bulga Underground Operations**. Furthermore, the site as a whole will be referred to as the **Bulga Coal Complex**.

This AEMR details the environmental and community performance of Bulga Coal Complex for the 12 month reporting period of 1 January 2010 to 31 December 2010. It has been prepared in accordance with the industry guideline prepared by the NSW Department of Industry and Investment (DII) (formerly the Department of Primary Industries – Mineral Resources), entitled *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (Version 3, 2006), as well as the relevant Bulga Coal Complex regulatory framework.

Within this AEMR the operational aspects of the Bulga Surface and the Bulga Underground Operations are discussed separately in **Section 2.0**. The environmental performance and community relations of the Bulga Coal Complex have been reported in **Sections 3.0** and **4.0**, respectively. **Section 5.0** details the rehabilitation activities undertaken on site during the reporting period, while **Section 6.0** describes what activities are planned for 2011.

### 1.1 Regulatory Framework

Bulga Coal Complex operations are regulated by a range of leases, licences and approvals. These leases, licences and approvals are summarised in the following sections.

#### 1.1.1 Development Consent/s

Bulga Coal Complex operates under three NSW development consents (Bulga Surface Operations DA 41-03-99 and DA 38-3-2005, Bulga Underground Operations DA 376-8-2003) and a Commonwealth Environment Protections and Biodiversity Conservation Act 1999 approval, the details of which are provided below in **Table 1.1**.

During 2010, the fifth modification to the Bulga Surface Operations DA 41-03-99 was approved. The modification contemporised the noise criteria and includes both Surface and Underground activities.

Approval to modify the Bulga Underground Operations DA 376-8-2003 was granted on 21 December 2010. The modification includes construction and operation of (up to) 25 MW of gas fired reciprocating engine power generation units and associated infrastructure, a pilot ventilation air methane (VAM) abatement system and a common and inclusive noise criteria with the Bulga Surface operations.

Table 1.1 Development Consents

Consent	Details	Expiry Date
DA 376-8-2003	Bulga Coal Continued Underground Operations	22 February 2031
	Mod 4-1-2006 – Relocation of Men & Materials Drift	
	Mod 113-9-2006 – Increase Washery Capacity	
	Mod 19-3-2007 – Blakefield South Modification	
	Mod 4 2010 – Power Generation Plant & VAM Abatement Unit and Noise Criteria	
DA 41-03-99	Bulga Coal Surface Operations	23 December 2020
	Mod 1 – Approved 15 February 2001	
	Mod 2 – Approved 11 January 2008	
	Mod 3 – Approved 5 November 2008	
	Mod 4 – Approved November 2009	
Mod 5 – Approved July 2010		
DA 38-3-2005	Bulga Coal Surface Operations – Mt Thorley Overburden Dump	25 May 2011
EPBC 2002/773	Commonwealth Land Consent	22 November 2034
	Mod 2002/773 – Commonwealth Land Subsidence Management Plan (SMP) Submission Schedule	

### 1.1.2 Leases

The Bulga Coal Complex covers several leases as shown in **Figure 1.3**. During the reporting period a number an application to renew Exploration Licence 5277 was made to the DII. Details of the renewals are included in **Table 1.2**.

Table 1.2 Leases

Lease	Details	Expiry Date
ML 1547	Bulga Coal Management Pty Ltd	4 April 2025
ML 1494	Saxonvale Coal Pty Ltd and Nippon Steel Australia Pty Ltd	20 September 2027
AU 450	Saxonvale Coal Pty Ltd	30 December 2013
AU 447	Saxonvale Coal Pty Ltd	1 September 2011
EL 5277	Saxonvale Coal Pty Ltd (renewal made to DII)	6 April 2010
EL 5461	Saxonvale Coal Pty Ltd and Nippon Steel Australia Pty Ltd	2 April 2013

### 1.1.3 Licences

#### Environmental Protection Licence

The Bulga Coal Complex operates under a single Environmental Protection Licence (EPL) No.563 – renewed annually on 29 July. Monitoring is reported to the Department of Environment, Climate Change and Water (DECCW) as part of the Bulga Coal Complex EPL Annual Return. The environmental reporting and monitoring activities undertaken at the Bulga Coal Complex, in accordance with EPL No.563 are discussed in **Sections 3.4** (blasting), **3.5** (dust) and **3.6** (surface water).

## Groundwater Licences

The Bulga Coal Complex currently holds the following Groundwater licences.

**Table 1.3 Groundwater Licences**

Licence	Details
20PT910663	Dewatering (mining): South Bulga Longwall 1. Previously 20BL166725. Volume licence Limit 207ML
20PT91198D	Mining: Underground workings. Previously 20BL169347. Volume licence limit 365ML
20BL166867	Monitoring (mining bore): GW1 – GW10. Total of 16 bores from monitoring purposes.
20BL167776	Monitoring: P1-P3, P4A, P4B, P5-P8 and V3. Licence for total of 9 bores for monitoring purposes.
20BL169510	Monitoring: WBR50 WBR50A, WBD55, WBD55A, WBD 57, WBD57A, WBD62, WBD62A, WBR15
20BL169204	Test Bore: Bore – ACARP Project
20BL169246	Test Bore: Bore – ACARP Project
20CA208597	Irrigation for Wells at Feeney Property. Replaces licences 20NL167756, 20BL167757, 20BL167758 and 20PT910688. Spear points and two wells. Total Volume Limits 290ML.
20BL167324	Domestic, irrigation, farming and stock: Well (Fernance). Volume Licence Limit 80ML.
20BL167777	Monitoring: V1, V2, F1 and F2.
20BL167778	Dewatering (mining): Bore South Bulga Longwall 3. Volume licence limit 300ML.
20BL168475	Dewatering (mining): Beltana Longwall 1 Borehole. Volume licence limit 500ML.
20PT91176D	Dewatering Beltana MG4. Volume Licence limit 500ML. Previously 20BL167514.
20BL166915	Irrigation Larkin Property. Volume Licence Limit 50ML.

## Surface Water Licences

The Bulga Coal Complex currently holds the following Surface Water licences.

**Table 1.4 Surface Water Licences**

Licence	Details
20SL033360	Irrigation: Surface (Fernance). Volume Licence Limit 188ML.
20CA208650	Irrigation. Volume licence limit 365ML. Replaces licence 20SL037183.
20AL208598D and 20AL211234D	Irrigation Fordwich Hill. Volume Licence Limit 66ML. Replaces licences 20SL060264 and 20SL 060265
Agreement with Singleton Council	1140ML/ year from the Mount Thorley Pumping Scheme

## Density Gauge Licences

The Bulga Coal Complex conducted a review of its density gauges which resulted in a consolidation of the existing density gauges into a single Licence approved by DECCW. Details of the density gauge licence and the included sealed source device are provided in **Table 1.5**.

Table 1.5 Density Gauge Licences

Licence	Details	Expiry Date
RL32213	Serial No: 4376GK - Nominal Activity: 1850MBq (DECC Reg No : 2036) Serial No: 4412GK - Nominal Activity: 1850MBq (DECC Reg No : 2037) Serial No: 4421GK - Nominal Activity: 1850MBq (DECC Reg No : 2042) Serial No: 6230GK - Nominal Activity: 1850MBq (DECC Reg No : 2047) Serial No: 6218GK - Nominal Activity: 2076MBq (DECC Reg No : 2046) Serial No: 0539/07 - Nominal Activity: 740MBq (DECC Reg No : 2188) Serial No: 0538/07 - Nominal Activity: 740MBq (DECC Reg No : 2187) Serial No: 0538/07 - Nominal Activity: 740MBq (DECC Reg No : 2187) Serial No: 0528/07 - Nominal Activity: 3700MBq (DECC Reg No : 2190) Serial No: 0532/06 - Nominal Activity: 3700MBq (DECC Reg No : 2173) Serial No: 0532/06 - Nominal Activity: 3700MBq (DECC Reg No : 2173) Serial No: OC519 - Nominal Activity: 1850MBq (DECC Reg No : 49314 - 0010)	31 August 2013

### Dangerous Goods Licence

Bulga possesses Dangerous Goods Licence No.07-100015-001 (South Bulga and Beltana Collieries), which expires 8 May 2011, and Licence No.07-100095-001 (Surface Operations), which expires 17 January 2012.

#### 1.1.4 Mine Operations Plan Status

The Surface Operations submitted a Mining Operations Plan (MOP) Amendment to DII in December 2009. This MOP Amendment, approved in 2010 allows for an increase in the dumping height across the Blakefield Dumps to RL150 area. The changes proposed enable the North and South Blakefield dump rehabilitation areas to be joined far earlier than the originally approved MOP. This allows improved capture and management of clean runoff from completed rehabilitation areas and connection of rehabilitation with established vegetation corridors.

No amendments to the Underground Operations 2007 MOP were made during the reporting period.

#### 1.1.5 Regulatory Compliance

It is a condition of consent(s) (Condition 5(f), Schedule 6 of DA 376-8-2003, Condition 9.1(a) (viii) of DA 41-03-99 and Condition 8 of DA 38-3-2005) that the Bulga Coal Complex identifies any non-compliance during the previous year, and report within this AEMR. Legal compliance is monitored on a continual basis and includes analysis of monitoring results and the maintenance of a compliance checklist for internal auditing and inspections. This allows any areas of non-conformance to be identified and managed promptly.

A high level of compliance against approval conditions and applicable legislation was achieved during the 2010 reporting period. Throughout the year there were limited situations where particular criteria were exceeded, these specific exceedances are discussed in detail in the Quarterly Monitoring Reports located on the Bulga Complex website.

Development consent conditions (within DA-376-8-2003 and DA 41-03-99) also specify that an independent compliance audit must be completed every three years, to ensure each operation is fulfilling their respective approval requirements. To satisfy these conditions, compliance audits were undertaken during the 2009 AEMR reporting period, for both operations, and provided within the 2009 AEMR. The results of each audit identified that each operation generally showed a high level of compliance. There were however, a number of non-compliance issues for each operation. The audits identified a number of recommendations be undertaken by the Bulga Coal Complex in response to the non-compliances. To address these recommendations an action plan was developed outlining associated corrective actions and current progress. This plan has been provided in **Appendix A**.

## 1.2 Mine Contacts

The contact details for the personnel responsible for environmental management and community relations of the Bulga Coal Complex are provided in **Table 1.6**.

**Table 1.6 Primary Contacts for Bulga Complex**

Postal Address	Contact	Position	Contact details
<b>Surface Operations</b>			
Bulga Coal Management Pty Limited	Ben Hiatt	Operations Manager	T: 02 6570 2432
			F: 02 6570 2450
			E: <a href="mailto:bhiatt@xstratacoal.com.au">bhiatt@xstratacoal.com.au</a>
	Ralph Northey	Bulga Coal Complex Environment and Community Manager	T: 02 6570 2539
			F: 02 6570 2450
			E: <a href="mailto:rnorthey@xstratacoal.com.au">rnorthey@xstratacoal.com.au</a>
	Paul Amidy	Environment and Community Superintendent	T: 02 6570 2409
			F: 02 6570 2450
			E: <a href="mailto:pamidy@xstratacoal.com.au">pamidy@xstratacoal.com.au</a>
	Stephen Shoesmith	Environment and Community Officer	T: 02 6570 2529
			F: 02 6570 2450
			E: <a href="mailto:sshoesmith@xstratacoal.com.au">sshoesmith@xstratacoal.com.au</a>
<b>Underground Operations</b>			
Beltana Highwall Mining Pty Limited	Mark Munro	Operations Manager	T: 02 6570 4300
			F: 02 6570 4344
			E: <a href="mailto:mmunro@xstratacoal.com.au">mmunro@xstratacoal.com.au</a>
	Ned Stephenson	Environment and Community Superintendent	T: 02 6570 4366
			F: 02 6570 4344
			E: <a href="mailto:nstephenson@xstratacoal.com.au">nstephenson@xstratacoal.com.au</a>
	Nathan Lane	Environment and Community Officer	T: 02 6570 4281
			F: 02 6570 4344
			E: <a href="mailto:nlane@xstratacoal.com.au">nlane@xstratacoal.com.au</a>

## 1.3 Actions Required at Previous AEMR Review

The 2009 AEMR for the Bulga Coal Complex was reviewed by DII Regional Environmental Officer Michael Lloyd, including a site inspection in May 2010. The assessment concluded that the AEMR report was a thorough review of the environmental and subsidence performance of the mine complex.

# Figure 1.1 BULGA COAL COMPLEX LOCALITY PLAN

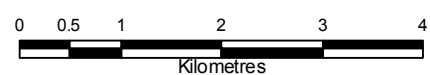
**MINING LEASE**

- Sub Lease
- HIGHWAY
- Road
- Railway
- Watercourse
- Minor Watercourse

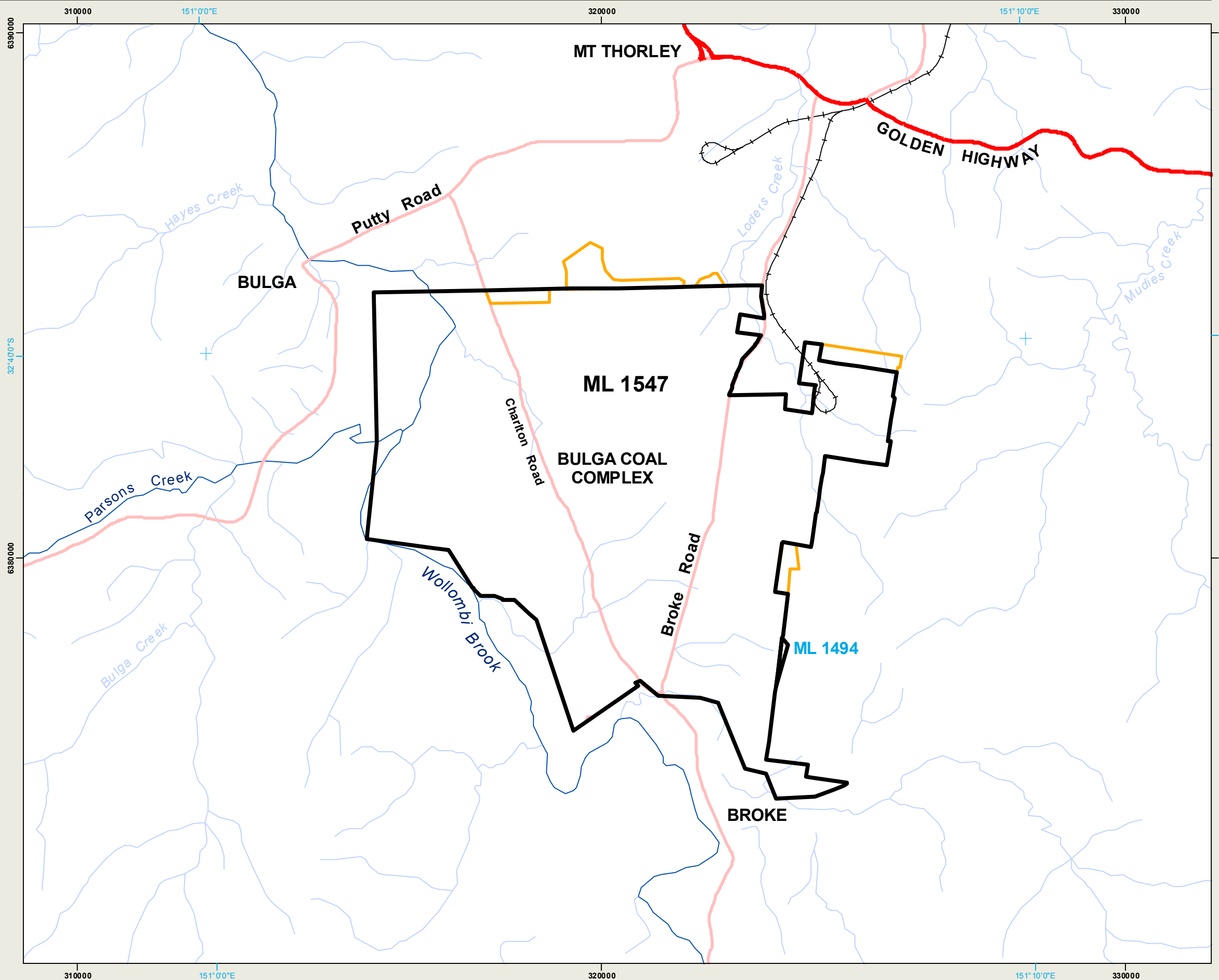


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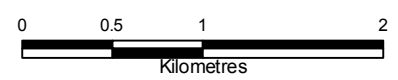
# Figure 1.2 BULGA COAL COMPLEX MINING OPERATIONS 2010

-  **MINING LEASES**
-  **Complex Locations**
-  Beltana Mine Workings
-  Blakefield South Mine Workings
-  **Road**
-  **Railway**

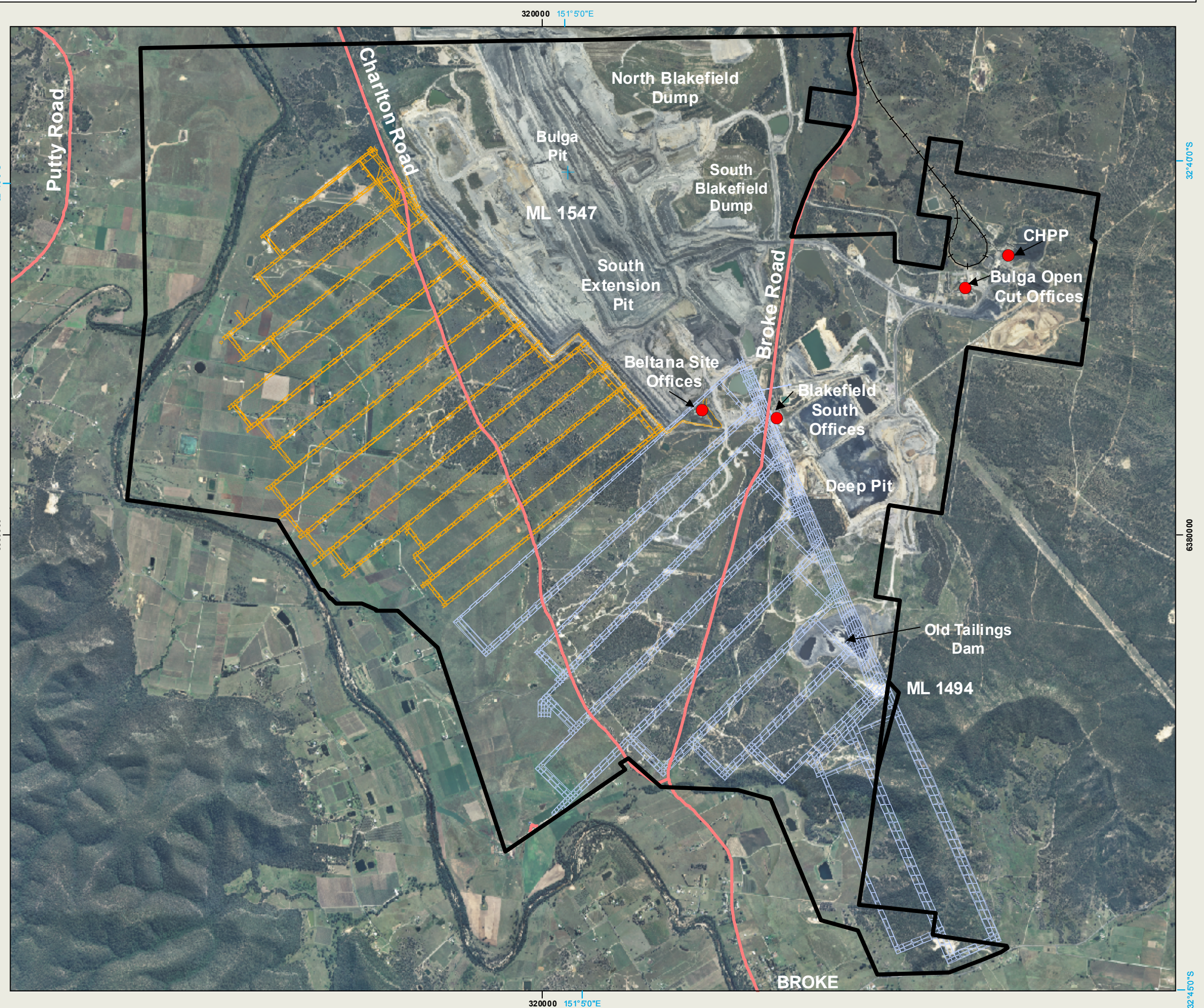


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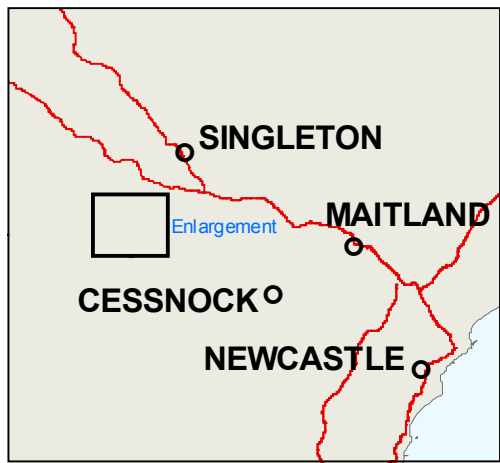


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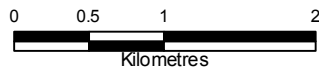
# Figure 1.3 BULGA COAL COMPLEX MINING TENEMENTS

-  **MINING LEASES**
-  Sub Leases
-  Mining Lease Application Area
-  Exploration Licences
-  Authorisations
-  Road
-  Cadastre

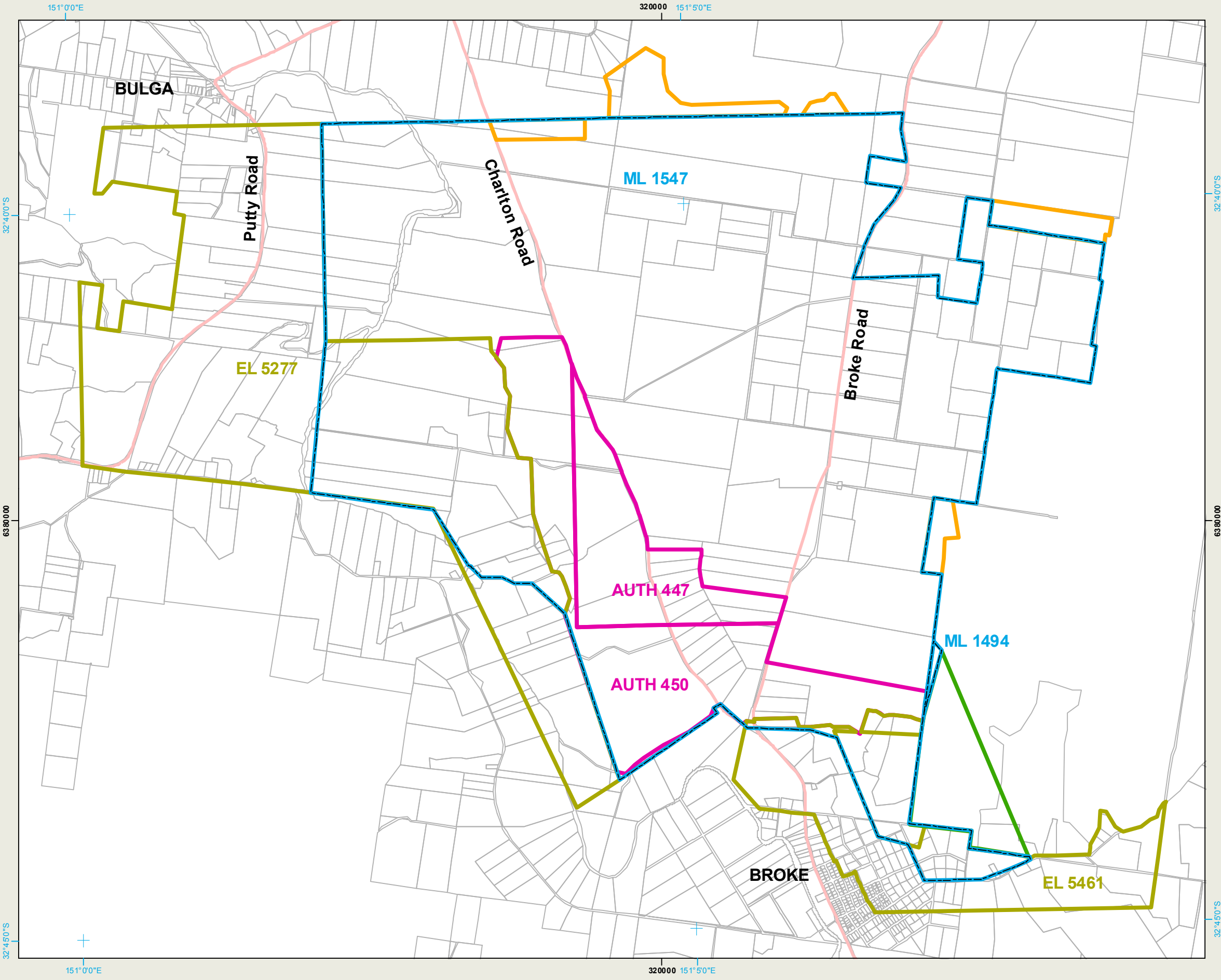


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## 2.0 SUMMARY OF OPERATIONS

### 2.1 Underground Operations

The Bulga Underground Operations comprise the Beltana No.1 Mine and the Blakefield South Mine. Underground mining operations are undertaken using longwall retreat mining techniques. The longwall blocks at the Beltana No 1 Mine are approximately 265m wide, and at Blakefield South they are either 330m or 400m. Coal in each longwall panel is removed through the use of a shearer. The shearer moves along the longwall face shearing off coal and then loading it onto a conveyor. Large steel hydraulic roof supports are used to ensure the roof does not collapse. As the shearer progresses along the longwall and coal is extracted, the steel hydraulic roof supports move into the newly extracted area. The mined out area behind the steel hydraulic supports is known as the goaf. As roof supports are moved, the goaf collapses resulting in subsidence on the surface above the longwall panels. This process is continued until the longwall panel has been extracted back to the main access roadways.

Activities undertaken during the reporting period included underground mining, gas drainage, facilities construction and rehabilitation. The extent of these activities is illustrated on **Figure 2.1** and discussed in the following sections.

#### 2.1.1 Exploration

No exploration drilling was performed during 2010 for the Underground Operations at the Bulga Coal Complex.

#### 2.1.2 Construction












Construction of the following surface infrastructure was undertaken at the Underground Operations during 2010:

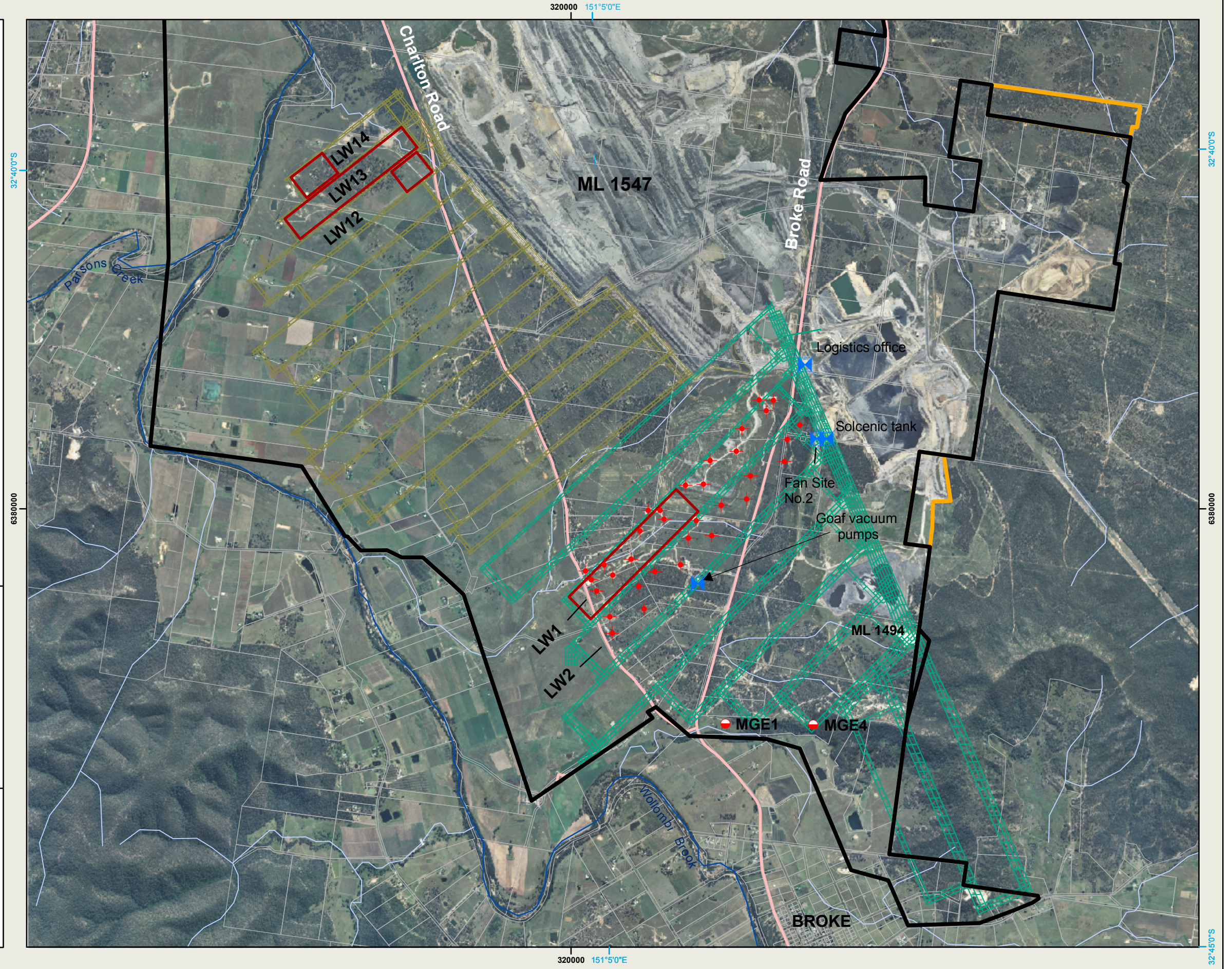
- The second main ventilation shaft and fan at Blakefield South was completed in 2010. This ventilation fan draws from the underground while the first ventilation fan now pushes air into the underground workings. Balancing the rate of both fans creates a positive pressure across the longwall mining face and increases the safety and rate at which mining can take place;
- Wollombi Brook Flood Levee. The flood levee commenced in late 2009 was completed and all exposed areas grassed in early 2010, see **Plate 2.1**;



**Plate 2.1 – Wollombi Brook Flood Levee (2009, 2010)**

# Figure 2.1 UNDERGROUND OPERATIONS SUMMARY 2010

-  **MINING LEASES**
-  Construction Activities
-  Constructed Gas Wells
-  Dewatering Bores
-  Beltana Mine Workings
-  Blakefield South Mine Workings
-  Area Undermined
-  Road
-  Watercourse
-  Minor Watercourse
-  Cadastre




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 Coordinate System: MGA (GDA 94) Zone 56



- Goaf suction plant. The vacuum pumps and associated equipment was constructed beside the existing Energen gas flares, see **Plate 2.2**. Two of the four pumps were commissioned in 2010 with the remaining two coming on line in 2011; and



**Plate 2.2 – Goaf Gas Drainage Suction Plant**

- Logistics office. An extra demountable building was added to the Blakefield South administration area to accommodate the extra workforce relocated from Beltana during the year.

### 2.1.3 Mining Operations

Development roadways for each longwall block at the Beltana No 1 Mine are constructed directly into the Lower Whybrow seam from the base of the highwall in the existing Whybrow Pit. There were no changes in mining methodology throughout the reporting period.

The development of the Blakefield South mine continued during the reporting period. Access to the Blakefield seam is gained via a cross measure drift entry from the floor of the existing Whybrow box cut. Mining in the Blakefield seam was undertaken using a combination of continuous mining and longwall retreat mining techniques.

The Blakefield seam ranges from 4.5 to 8m in thickness within the Blakefield South longwall area, with the extraction thickness ranging from approximately 2.2 to 3.7m, due to the operating range of the available longwall equipment.

### 2.1.4 Coal Handling, Preparation, Course and Fines Reject

The coal mined by the Bulga Underground Operations is transported via overland conveyor to the CHPP where it is processed. The CHPP is operated as a joint facility of the Underground and Surface Operations. Details of the CHPP are provided in **Section 2.2.5**.

The product handling facilities are managed by the Bulga Surface Operations. Details of product handling are provided in **Section 2.2.5**.

The Bulga Surface Operations undertake management of course and fines reject. This is described in **Section 2.2.5**.

### 2.1.5 Waste Management

Waste management is undertaken in accordance with the Bulga Coal Complex Waste Management Plan and includes mechanisms to:

- Comply with the conditions of both development consents, the shared environment protection licence and waste management legislation;
- Identify all types and quantities of waste generated;

- Minimise waste generation and encourage recycling of waste streams where possible;
- Undertake appropriate segregation, storage, transportation and disposal of waste generated;
- Effectively manage hydrocarbons, wastewater and sewage; and
- Provide education and training programs to site personnel and contractors regarding waste minimisation measures, waste handling and disposal.

Strategies to manage the major types of waste produced at the Bulga Coal Complex are discussed below.

### **Sewage Treatment and Disposal**

Sewage generated by the Bulga Underground Operations is pumped to an extended aeration sewage treatment plant located at the Blakefield South pit top facilities. The treated overflow then reports to the tailings dam.

### **Oil and Grease Containment and Disposal**

Bulga Coal Complex has ongoing contracts for the supply, removal and recycling of oils and diesel.

The Underground Operations use bulk oil wherever possible to reduce the quantity of oil drums on-site. Oil for the underground is delivered in either 1000 litre pods or 20 litre drums and stacked inside bunded areas. Empty drums are returned to the surface and removed. Waste solsenic oil is removed for disposal at a licensed facility.

### **Rubbish Disposal**

All rubbish disposal associated with the Underground Operations are undertaken in accordance with the approved Bulga Complex Waste Management Plan. Waste is removed by a licensed contractor and where appropriate recycled.

The main materials that are recycled include steel, paper, plastics and batteries. During the reporting period 76% of waste produced by the Underground Operations that was removed from site was recycled. This is an improvement of 8% from 2009. The Underground Operations has implemented a recycling target of 55%, which was exceeded during every month of 2010.

### **2.1.6 Water Management**

The Bulga Coal Complex has a water balance model to assist in the management of water onsite. The water balance model is used to review performance and to undertake short term projections (12 months) of the water requirements. The water balance model is also used to predict water needs for the life of the mine. Major water transfers are monitored via a series of flow meters and water storage volumes are measured each fortnight.

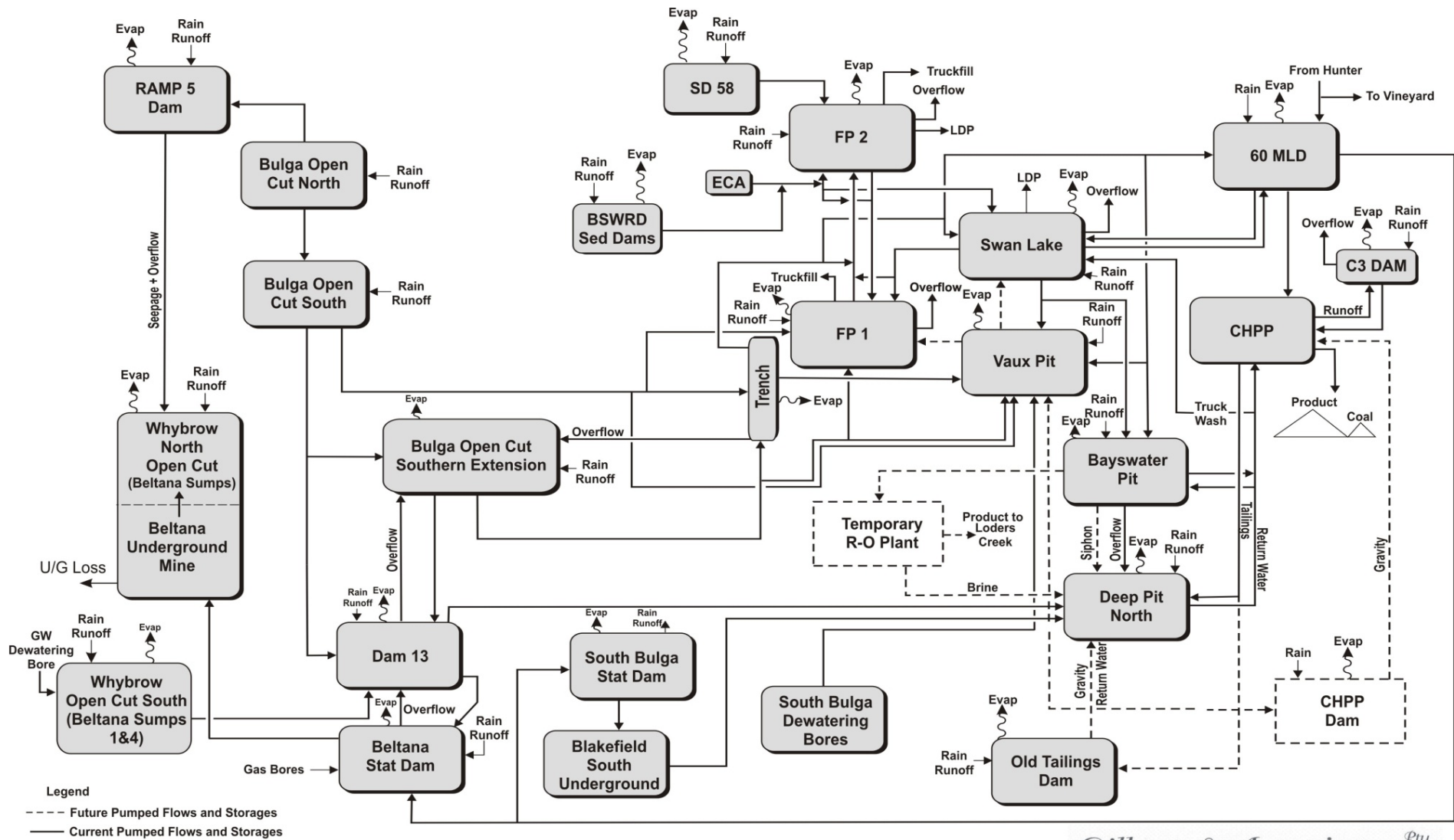
A schematic of the Bulga Complex water management system is presented on page 18. A 3,000 ML mine water storage dam is currently being constructed as will be further described in **Section 2.2.3**. The dam is being constructed to minimise the potential impact of storm water which reports to the mining operations and to minimise the potential requirements to draw water from the Hunter River. The Bulga Complex annual monitored water flows and water balance for the reporting period are presented in **Tables 2.1** and **Table 2.2** respectively.

Table 2.1: Annual Monitored Water Flows 2010

Water Management Component	Pumped Transfers	Inflow (ML)	Outflow (ML)	In Storage at end of year (ML)	Capacity (ML)
Bulga Surface Operations	Pit Dewatering to Quick Fill Dam 1	887	712	122	NA
Bulga CHPP (Consumption)	Supply from 60 ML Dam & Bayswater Pit	3972	NA	NA	NA
Tailings Dams (North and South)	Tailings bleed & runoff, Pump to Bayswater	2930	1636	1627	NA
Beltana Underground and South Bulga Mine Dewatering (Consumption and supply)	Supply from Statutory Dam, Dewatering to Dam 13 and Open Cut Mine Water System	1736.10	251.89	74	60
Blakefield Underground (Consumption and Supply)	Supply from Statutory Dam, Dewatering to Vaux Pit	4.63	315.36	1387.24	1800
Blakefield Gas Drainage Wells Dewatering	Water Make from Pre Drainage of methane from coal seams prior to mining.	59.57	NA	59.57	NA
60 ML Dam (Hunter River supply point)	Inflows from Hunter River, Outflows to Swan Lake, Beltana, Open Cut & CHPP	18	6.3	31	60
Quickfill Dam 1	Inflows of Swan Lake, outflow to Truckfill	586	567	23	86
Quickfill Dam 2	Inflows of Swan Lake, outflow to Truckfill	161	153	70	90
Swan Lake	Inflows from Swan Lake, outflow to QF1/ QF2	320	40	110	268
Dam 13	Inflows from Whybrow/ Beltana underground, outflow to QF1	1965	1965	62	99
Potable Water - Surface Operations	Sourced from Broke Potable Water Supply Line	50	NA	NA	NA
Potable Water - Underground Operations	Sourced from Broke Potable Water Supply Line	11.13	NA	NA	NA

Table 2.2: Bulga Coal Complex 2010 Water Balance

	Volume (ML)
<b>Water Inventory and Capacity</b>	
Total estimated water stored on site 1 <sup>st</sup> January 2010	5,300
Total estimated contaminate capacity at 1 <sup>st</sup> January 2010	0
Total estimated water stored on site 31 <sup>st</sup> December 2010	4,200
Total estimated contaminate capacity at 31 <sup>st</sup> December 2010	0
Change in water inventory	-1,100
<b>Inflows</b>	
Water extracted from Hunter River (monitored)	6.3
Rainfall and runoff intercepted from mine areas	3,376
Groundwater recovered from Surface Operations	0
Groundwater recovered from Underground Operations	474
Total Inflows	3,856
<b>Outflows</b>	
Evaporation	1,352
Discharge to Hunter River under HRSTS	223.7
Net 'Loss' to tailing disposal storage and product coal and coarse rejects	1,977
Dust suppression	632
Total outflows	4,185



Gilbert & Associates Pty Ltd

### 2.1.7 Hazardous Materials Management

All hazardous and dangerous goods associated with the Underground Operations are stored and labelled in accordance with AS1940 – 1993 – ‘*The Storage and Handling of Flammable and Combustible Liquids*’ (AS1940 – 1993). Late in 2010 an audit on the storage of hydrocarbons across the Bulga Underground Operations was undertaken. Both the Beltana and Blakefield South pit-top facilities were found to be generally fit for purpose, however there were some items of housekeeping that require attention. The recommendations from this audit are planned to be adopted in 2011.

#### Storage

Detailed discussion of storage facilities is provided in **Section 2.2.7**.

#### Identification

A register containing Material Safety Data Sheets (MSDS) for all hazardous substances used and stored on site is maintained at Mine Support Office. The site also maintains ‘ChemAlert’, an online tool which enables access to MSDSs for chemicals held on site. This program is available on computers located at relevant areas throughout the complex. Procedures for the purchase, handling, usage, storage, labelling and disposal of hazardous substances have been developed throughout the site and are communicated to employees and contractors.

Hazardous waste requires written agreements with a licensed waste transporter for the transportation of hazardous waste for disposal at a suitably licensed facility.

## 2.2 Surface Operations

Surface Operations target the Redbank, Wambo, Blakefield, Glen Munro and Woodlands Hill seams of the Whittingham coal measures. The Surface Operation has approval to extend the Bulga Pit to the south and west of its current location. The extent of these activities in 2010 is illustrated on **Figure 2.2** and discussed in the following sections.

### 2.2.1 Exploration

Exploration activities during 2010 were undertaken for the purpose of resource and structure definition of the Foybrook and Bayswater coal seams. A total of 28 cored holes were drilled at an average depth of 314m, all of which were located within the Surface Operations mining lease (ML) 1547. The location of the cored holes is shown on **Figure 2.2**.

### 2.2.2 Land Preparation

Land preparation ahead of open cut mining operations involves the consideration and construction of appropriate erosion and sediment controls measures, clearing of vegetation and stripping and stockpiling of topsoil.









It is a requirement of the Surface Operations Development Consent (DA 41-03-99) to develop and implement a Soil Stripping Management Plan. All soil stripping and topsoil stockpiling at the Surface Operations is undertaken in accordance with this approved plan.

Where applicable topsoil, grassland, fragmented woodland communities and previously rehabilitated land are cleared 100m ahead of mining. Vegetation and vegetative matter are stockpiled for future use within the rehabilitation process. Topsoil stockpiles are generally kept to a height of 3m or less, are set out in windrows to maximise surface exposure and promote biological activity.

During 2010, land preparation was undertaken across a number of areas, including:

- CHPP Dam Construction Site (49.27ha); and
- Ramp 4 Area (18.42ha).

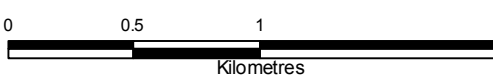
# Figure 2.2 SURFACE OPERATIONS SUMMARY 2010

-  **MINING LEASES**
-  **Sub Leases**
-  **Exploration Drilling**
-  **CHPP Dam Construction**
-  **Rehabilitation**
-  **Disturbance**
-  **Road**
-  **Cadastre**

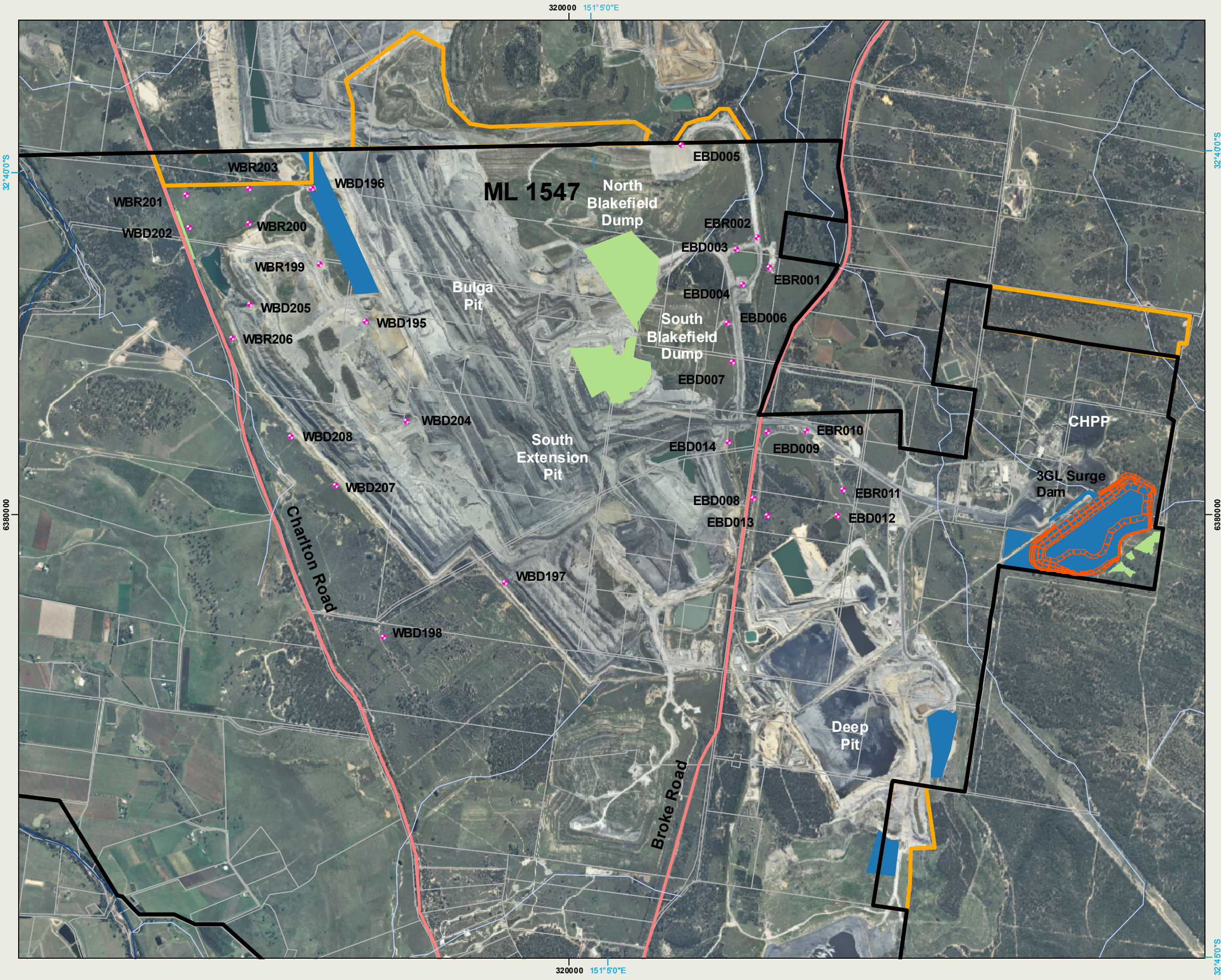


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1: 30,000 @ A4  
 Coordinate System: MGA (GDA 94) Zone 56



### 2.2.3 Construction

During 2010, the Bulga Coal Surface Operations commenced construction of a 3,000ML CHPP Surge Dam, seen in construction in **Plate 2.3**. This dam will form an integral component of the Bulga Coal Complex Water Management Plan (WMP), incorporating the Integrated Water Management System that will service both the Underground and Surface Operations in accordance with the operating philosophy documented in the approved WMP.

Dam construction was not completed during the 2010 reporting period. Ongoing delays which have resulted mainly from rainfall throughout 2010 have pushed the expected completion date to Quarter 3, 2011.

The new heavy vehicle wash down bay facility commenced construction in 2009 was suspended in 2010 due to design related issues. These issues were resolved and the facility is expected to be completed in 2011. The light vehicle wash down bay will also be upgraded during 2011.



**Plate 2.3 – Construction of CHPP Surge Dam**

### 2.2.4 Mining Operations

During 2010, the Surface Operations consisted of mining coal reserves from the Bulga and Southern Extension pits in the ML1547 lease area. Mining is progressing in a westerly direction with the overburden being placed in either the North or South Blakefield Dumps. Run of mine (ROM) coal is transported by dump truck via an overpass on Broke road to the ROM coal stockpile at the CHPP.

Stripping during 2010 was undertaken with a dragline assisted by a truck/shovel pre – strip fleet. Coal was mined by an excavator, front end loader and truck fleet (full Bulga fleet shown below in **Table 2.3**). There were no changes in mining methodology during the 2010 reporting period.

**Table 2.3 - Bulga Coal Surface Operations Mining Fleet**

Type	Model	Units
Dragline	P&H9020	1
Shovels – Electric	P&H4100	1
Shovels – Hydraulic	Hitachi EX8000	1
	Hitachi EX5500	2
	Hitachi 3500	1
	Komatsu PC4000	1

Type	Model	Units
Haulage Trucks – mine owned	Cat 793C XQ	10
	Cat 793D XQ	20
	Cat 789	10
	LeTourneau L1850	1
	Komatsu WA 900	1
Front End Loaders	Komatsu WA 1200	1
	Komatsu WA 500	1
	Cat D11R	11
	Cat D10R	1
Dozers – Tracked, mine owned	Cat D10	1
	Cat 834H	1
Dozers – Tracked, hired	Cat 16H	1
Dozers - Tyred	Cat 16M	1
Grader	Cat 24H	1

A summary of coal production and waste material (overburden) production is provided in **Table 2.4**.

**Table 2.4 Production and Waste Summary for the Surface Operations and CHPP**

	Cumulative Production		
	Start of Reporting Period – Jan 2010	End of Reporting Period – Dec 2010	2011 (Forecast)
Topsoil stripped (m <sup>3</sup> )	1,759,840	1,773,378	1,785,778
Topsoil used/spread (m <sup>3</sup> )	868,640	873,040	877,040
Waste rock (m <sup>3</sup> )	575,903,035	622,705,707	678,927,117
ROM Coal (tonnes)	131,708,911	140,351,627	149,252,917
Processing waste (tonnes) (coal tailings and coarse reject)	49,380,832	54,974,668	60,613,889
Product Coal (tonnes)	85,811,185	91,574,945	97,496,068

During the reporting period, ROM production from the Open Cut Operations totalled 8,642,716 tonnes, processing waste (incorporating coal tailings and coarse reject) totalled 2,936,246 tonnes and product coal totalled 5,763,760 tonnes. The total overburden moved during the 2010 reporting period was 124,832,926 tonnes. Topsoil stripped during the reporting period totalled 13,538 cubic metres.

#### Forecast Production for 2011

Surface forecast overburden statistics for 2011 are shown in **Table 2.5**.

Table 2.5 Forecast Overburden Statistics 2011

Overburden Type	Forecast Volume (tonnes)
Dragline overburden	30,075,555
Truck - shovel overburden	102,044,759
Reject	3,330,123
<b>Total</b>	<b>135,450,437</b>

### 2.2.5 Coal Handling, Preparation, Course and Fines Reject

Coal mined by the Surface Operations is trucked to a receival hopper at the CHPP ROM stockpile site. The coal is either directly washed or is stacked temporarily and then later reclaimed by front-end loaders.

The product coal handling facilities consist of a dual product conveying system from the CHPP to separate stockpiles and reclaiming facilities for coking coal and thermal coal.

Clean coal is reclaimed from the product coal stockpiles and loaded into a 1500t bin, which enables the loading of trains. The total ROM (for the Bulga Coal Complex) coal processed in 2010 was 15.4Mt, producing 9.8Mt of product coal. It is budgeted for the Bulga Coal Complex to process 16.3Mt of ROM coal in 2011, producing approximately 10.6Mt of product coal for the 2011 reporting period. Reduced production from the underground operations means that considerably less coal will be washed in 2011 than that originally planned.

#### Coal Rejects

Coarse and fine rejects are produced during the coal preparation process at the CHPP. Coarse rejects are currently placed in the Bulga Pit and incorporated into the rehabilitation works. Fine rejects are thickened in the CHPP and pumped to one of two tailings dams. These two tailings dams are called the Deep Pit and Old Tailings Dam respectively. Additional paste thickened tailings are also co-disposed with the coarse rejects in the Bulga Pit.

A number of modifications to tailings storage facilities were made during 2010. The conveyor separating the two tailings dam cells in the Deep Pit was removed allowing for the Northern and Southern Cells to be combined. This resulted in a significant increase to the capacity of this tailings dam. Approval by DII to reinstate the Old Tailings Dam was granted in August 2010 pursuant to Section 100 of the Coal Mine Health and Safety Act 2002. The reinstatement of Old Tailings Dam as a tailings storage facility further increases the tailings storage capacity of the Bulga Coal Complex.

The life of tailings storage at the Bulga Coal Complex is approximately 20 years assuming half the tailings are co-disposed with the coarse reject. The locations of tailings storage facilities are illustrated in **Figure 1.2**.

#### Waste Management

Waste management is undertaken in accordance with the approved Bulga Complex Waste Management Plan as described in **Section 2.1.5**. Strategies to manage the major types of waste produced at the Bulga Coal Complex are discussed below.

#### Sewage Treatment and Disposal

The treatment and disposal of sewage associated with the surface operations is undertaken through one extended aeration sewage treatment plant. Effluent from this plant goes to two maturation ponds before it is returned to the CHPP circuit water.

Any deactivated sludge is transported to the Singleton Council Treatment Works Depot.

## Oil and Grease Containment and Disposal

All waste oil and grease from surface operations is removed from equipment either at the workshop or lube/service bay and stored in large bunded tanks. Waste water generated from the workshop areas on site is treated through Ultraspin Hydrocyclone oily water separators. Waste oil and oily water is removed from the site by an authorised waste contractor for recycling.

## Rubbish Disposal

All rubbish disposal associated with the Surface Operations is undertaken in accordance with the approved Bulga Complex Waste Management Plan. Waste is removed by a licensed contractor and where appropriate, the waste is recycled. Wastes removed from site include batteries, tyres, scrap metal, domestic waste, fuel and oil filters, solvent, radiator coolant, wooden pallets, oily rags and hydrocarbon contaminated spoil.

During 2010 a total of 89% of the waste produced by the Surface Operations and that which was removed from site, was recycled. This is an improvement from of 12% from 2009. The Surface Operations has implemented a recycling target of 80%; this target was exceeded 10 out of 12 months during 2010.

### 2.2.6 Water Management

In accordance with development consent (DA 41-03-99) Condition 4.1, Bulga Surface Operations has submitted a revised Site Water Management Plan to the Director-General during the reporting period.

Because water is managed across the Bulga Coal Complex as an integrated system, details have already been reported in **Section 2.1.6**, and in **Tables 2.1** and **2.2**.

### 2.2.7 Hazardous Materials Management

Hazardous and dangerous goods associated with the Surface Operations are stored in a manner that is consistent with AS1940 - 1993.

#### Storage

The facilities that store fuel, oil and hazardous chemicals have been designed in accordance with AS 1940 – 1993. The system has been designed to include computerised controls for the purpose of monitoring and identification of faults, and includes:

- Impervious walls and floors;
- Sufficient capacity to maintain 110% of the volume of the tank (or 110% volume of the largest tank where more than one tank is stored in the bund);
- Walls not less than 250 mm high; and
- Have floors graded to a collection sump.

Explosives for surface operations are stored in licensed explosive magazines in accordance with Workcover requirements. The Dangerous Goods Licence (No.07-100095-001) covers the storage of these materials.

#### Identification

A register containing MSDSs for all hazardous substances used and stored on site is maintained at central locations around the mine. The site also maintains 'ChemAlert' which is an online tool whereby many PCs have access to MSDSs for chemicals held on site. Procedures for the purchase, handling, usage, storage, labelling and disposal of hazardous substances have been developed throughout the site and communicated to contractors and employees.

## **Disposal**

Hazardous waste requires written agreements with a licensed waste transporter for the transportation of hazardous waste for disposal at a suitably licensed facility.

## 3.0 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

### 3.1 Environmental Risks

Identification of environmental risks at the Bulga Coal Complex is undertaken via an internal risk assessment process using the Xstrata Risk Management System.

As part of the annual review process the Surface Operations and Underground Operations completed a combined review of the E&C risks for the Bulga Coal Complex. Those aspects identified as having moderate risk include:

- Greenhouse gas emissions;
- Mine closure and rehabilitation;
- Cultural heritage;
- Impact on infrastructure by mine subsidence;
- Air quality;
- Noise; and
- Blasting.

Recognition of these aspects, and whether any changes in mining operations have led to changes in how the Surface and Underground Operations manage these aspects, is then reflected in reviews of site management plans and procedures. Furthermore, significant changes that may lead to modifications of Sustainable Development planning are included in the subsequent year's Environment & Community budget.

### 3.2 Meteorology

The Bulga Complex undertakes meteorological monitoring through two meteorological monitoring sites. Monitoring of meteorological conditions are requirements of both the Underground and Surface Operations development consents. The location of both meteorological stations is shown in **Figure 3.2**. The data presented in this report is from the Flares Weather Station located above the Underground Operations and south of the Surface Operations. Detailed meteorological data has been provided in **Appendix B**.

Historically the Bulga XCN Weather Station at the surface operations has been utilised, however ongoing technical issues and repairs were required in 2010, which resulted in a new station being established. The new station, identified as the 'Bulga Complex Weather Station', has been commissioned and tested ahead of reporting in 2011. It will provide improved representation of climatic conditions for the Bulga Surface Operations. The existing Bulga XCN Weather Station will be decommissioned, following approval from the NSW Department of Planning (DoP), thus allowing an upgrade of the existing facility.

### 3.3 Noise

#### 3.3.1 Environmental Management

##### Monitoring System

Noise monitoring at the Bulga Coal Complex is undertaken in accordance with the Bulga Complex Noise Management Plan. This system is designed to comply with Environmental Protection Licence No. 563 and the noise control conditions stipulated within the Bulga Coal Complex development consents. Noise monitoring includes the following:

- Quarterly monitoring which includes four nights of attended monitoring with a 15 minute period of attended monitoring undertaken at each site per night;



- Monitoring is undertaken by specialist consultants, Global Acoustics Pty Ltd (Global Acoustics);
- Monitoring of eight sites in accordance with DECCW 'Industrial Noise Policy guidelines and AS 1055 'Acoustics, Description and Measurement of Environmental Noise';
- Monitoring of atmospheric conditions;
- Additional noise monitoring triggered by complaints; and
- Real-time monitoring.

The real-time monitoring network at the Bulga Coal Complex is operated at four locations. These sites have been selected to be representative of the Fordwich, Bulga, Broke and Milbrodale localities. This data is recorded continuously and is reported real-time via a website. These monitoring results are able to be used to assist with the active management of operations at the Bulga Coal Complex and to effectively minimise the potential for elevated noise emissions. This real-time monitoring network is maintained by an independent noise consultant to ensure that the system is functioning correctly.

### Control Strategy

Noise management control strategies implemented at the Bulga Coal Complex have been undertaken in accordance with the approved Bulga Complex Noise Management Plan. Control strategies undertaken to effectively manage noise levels associated with operations at the Bulga Coal Complex during the reporting period include the following:

- Attenuation of the operating fleet;
- Allocation of day time and night time dumping locations within the mining schedule where applicable to provide unexposed locations for night time dumping;
- Installation of noise bunds above RL 80m where feasible to a height of approximately 4.5m above the existing level to effectively reduce noise emanating to the west of the operations where it is safe to do so; and
- Utilisation of the real time noise monitoring network to pro-actively manage operations and minimise adverse impacts to neighbouring receivers. This includes noise monitoring alarms that are set to trigger a staged review of the operation prior to noise levels reaching 35dB at residential receivers.

### Variations from Control Strategy/s

There were no variations from the control strategies and management measures outlined within the approved Bulga Complex Noise Management Plan.

### 3.3.2 Environmental Performance

#### Results

A yearly summary of noise monitoring data that was recorded for the Bulga Coal Complex has been provided below in **Table 3.1**. Further detailed noise monitoring data can be found in **Appendix C**.

**Table 3.1 Yearly Summary of Noise Monitoring Data**

Location	Measure	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB
Kennedy	average	37	34	32	30
	max	50	47	44	40
Bulga Village	average	44	41	39	36
	max	58	55	52	45
Halkin Estate	average	40	36	35	32
	max	52	47	44	41

Location	Measure	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB
Russell	average	40	37	36	34
	max	47	47	46	45
Lewis/BCM Gate	average	45	41	40	36
	max	54	52	51	49
McInerney	average	42	38	37	34
	max	47	45	44	42
Fordwich	average	37	34	32	29
	max	43	41	40	38
Hedley	average	45	42	40	38
	max	51	50	48	47

The Bulga Coal Complex complied with noise limits applicable at all monitoring locations during 2010, with the exception of 23 August 2010. A LA10(15 min) of 41 dB exceeded the relevant criterion by 1 dB, at the Russell residence.

According to the *Bulga Coal Surface Operations Environmental Noise Monitoring, Quarter 3 2010* (Global Acoustics, within **Appendix C**), on the 23 August at the Russell residence monitoring location an exhaust, engine and fan noise continuum from Bulga Surface Operations was audible throughout the measurement and was primarily responsible for the LAeq of 41 dB. Rear dump truck transmission noise was regularly audible with increases in transmission noise up to LA 39 dB. Dozer tracks (500 Hz and 630 Hz) were audible on four occasions. A reverse alarm was audible once but was not measurable.

Further, the monitoring report states that a continuum from Mt Thorley Warkworth was audible during the measurement, but did not contribute to measured levels. Frogs and insects were also audible during the measurement. This exceedance is not considered significant as Chapter 11 of the DECCW 'Industrial Noise Policy' deems a development to be in non-compliance only when "the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition."

### Performance Outcomes

The implementation of the abovementioned control strategies, in accordance with the approved Bulga Coal Complex Noise Management Plan has resulted in no exceedance of the noise criterion during the reporting period.

### Incidents and Improvements

During the reporting period there was one noise related incident recorded at the Bulga Coal Complex, this incident was recorded at the Russell Property on the 23<sup>rd</sup> August 2010.

Throughout the reporting period 22 noise related complaints were received by the Bulga Coal Complex. No community complaints were received as a result of the event recorded on the 22/23 August 2010. This was a substantial improvement from 31 noise related complaints that were received during the 2009 reporting period.

As a result of the abovementioned noise related incident and noise related complaints, a variety of actions were undertaken to mitigate the potential for future exceedances at the Bulga Coal Complex. Such improvements/measures included the following:

- Preliminary review of the equipment operating in the area, to gain a greater understanding of what circumstances have led to the exceedance;
- Strategies are being developed as a part of the revised Bulga Coal Complex Noise Management Plan including day and night time dumping locations; bunds and elevated haul roads;

- A procedure has been implemented as a part of the revised Bulga Complex Noise Management Plan which will utilise the Real Time Noise Monitoring data to proactively modify the operations to manage noise emissions; and
- The revised Bulga Complex Noise Management Plan was submitted to DoP for approval in August 2010.

### **3.4 Blasting**

#### **3.4.1 Environmental Management**

##### **Monitoring System**

The blast monitoring system for the Bulga Coal Complex is designed to ensure that blasting activities undertaken by the Surface Operations are completed in accordance the approved Blast and Vibration Management Plan. This document identifies management actions implemented by BSO to achieve compliance with the conditions outlined in the Bulga Coal Complex EPL No. 563 and in development consent DA41 – 03 – 99.

Monitoring is required to be undertaken at the closest non-project related residence (nearest sensitive receiver) to the Surface Operations. Three non-project related residences have permanent, remotely controlled blast monitors installed at or near their residence. The residences are Dawtrey, Lewis (within the mining lease) and Hedley (northeast of the mining lease). Measurements are recorded at the non-mine owned residence most likely to be affected during the blasting event. Information that is recorded from the nearest affected sensitive receiver includes the following:

- Measured air blast overpressure;
- Measured ground vibration; and
- Noise.

Additional information that is recorded during blasting activities includes the following:

- Explosive quantity;
- Distance from blast to monitoring location;
- Explosive type (blast type);
- Number of holes; and
- Weather conditions.

##### **Control Strategy**

A variety of control strategies have been implemented at the Bulga Coal Complex to manage and mitigate blasting impacts during the reporting period. The strategies listed below have been undertaken in accordance with the approved Blast and Vibration Management Plan:

- Consideration of Blast Design parameters including; explosives, individual charges, stemming material and stemming procedure;
- Assessment of Weather Conditions including; wind speed, wind direction, cloud cover, presence of inversions; and
- Management and Operation of blast vibration and overpressure monitoring network.

##### **Variations from Control Strategy/s**

There were no variations from control strategies and management measures outlined within the approved Blast and Vibration Management Plan during the reporting period.

### 3.4.2 Environmental Performance

#### Results

Blast monitoring results, as recorded at the Bulga Coal Complex during the 2010 reporting period, have been summarised below in **Table 3.2**. Monitoring of blasting activities has been undertaken at four sites associated with surface mining activities and has measured blast vibration (mm/s) and noise (dBL). Detailed blast monitoring data for the reporting period has been provided in **Appendix D**.

**Table 3.2 Summary of Blast Monitoring Results**

	Vibration (mm/s)	Noise (dBL)
<b>Blakefield</b>		
average	0.69	104.17
max	1.79	115.1*
min	0.17	94.7
<b>SXTN</b>		
average	0.48	104.60
max	1.55	116.37*
min	0.03	87.99
<b>Bulga</b>		
average	0.69	102.95
max	2.2	116.4*
min	0.02	87
<b>Redbank</b>		
average	0.49	104.16
max	1.24	113.92
min	0.03	93.59
<b>Annual Overall</b>		
average	<b>0.78</b>	<b>103.41</b>
max	<b>2.2</b>	<b>116.4</b>
min	<b>0.02</b>	<b>87</b>

*\*Compliance is breached where average occurs 5% of the time at > 115dB*

During the reporting period there were three occasions where noise levels associated with blasting activities were recorded above the 115dBL noise limit. The first of these events occurred at the Dawtrey Station at 11.48am on the 19<sup>th</sup> of February, with a measurement of 115.1dBL. The second also occurred at the Dawtrey Station at 12.53pm on the 11<sup>th</sup> of August, with a measurement of 116.4dBL. On the 12<sup>th</sup> of November a third event was recorded at the Lewis Station at 12.30pm. This event was recorded at 116.4dBL.

As there were only three occasions during the reporting period where blasting events were recorded above the 115dBL noise limit, the Surface Operations met the required condition of less than 5% of total blasts permitted to exceed the noise limit.

During the reporting period the vibration criterion of 5mm/s was not reached. Subsequently, blast monitoring for both noise and vibration has complied with relevant assessment criteria for the 2010 reporting period.

## Performance Outcomes

The implementation of control strategies and the blast monitoring system have effectively prevented blast related exceedances at the Bulga Coal Complex during the reporting period.

## Incidents and Improvements

No incidents relating to blasting at the Bulga Coal Complex were recorded during the reporting period, although a number of complaints were received. A total of seven complaints were received regarding blast related activities at the Bulga Coal Complex during the reporting period. These complaints focused on two main aspects of Blast Management;

### Overpressure / Vibration

Three complaints were received during the reporting period, following subsequent investigation 2 complaints were found to be within compliance limits and the 3<sup>rd</sup> complaint referred to a time period that Bulga Surface Operations did not fire a blast. Bulga Surface Operations communicated these results to each individual complainant and continues to engage with these community members in a form and timeframe discussed and agreed following the complaint.

A review of the current monitoring locations will be undertaken in 2011 to determine their appropriateness for determining offsite impact in their current location.

### Fume Management

Four complaints regarding blast fume were received during the reporting period. Bulga Surface Operations continues to engage and work with the community and the DoP to manage this aspect and is investigating opportunities to improve our blast performance to reduce the incidence of fume generation.

Early in the 2011 reporting period Bulga Surface Operations completed a review of the Blast and Vibration Management Plan in response to observed fume generation. In response to the review a revised improved management plan will be developed and submitted to the DoP for approval.

## 3.5 Air Quality

### 3.5.1 Environmental Management

Due to the scale of the Bulga Coal Complex, its proximity to adjacent neighbouring operations (eg Mt Thorley) and the local community, and the nature of operations undertaken at the site, the management of air quality is a very important issue. This section outlines the monitoring system, control strategies, environmental performance, reportable incidents and further improvements.

#### Monitoring System

The air quality monitoring system at the Bulga Coal Complex consists of a combination of Dust Deposition Gauges; Directional Dust Deposition Gauges; and High Volume Air Samplers (HVAS).

There are thirty Dust Deposition Gauges used for monitoring of larger dust particles (typically >50µm) that settle out from the air over approximately one month, referred to as *depositional dust*. Dust Deposition Gauges are sampled monthly (+/- 2 days) and results are used to determine insoluble matter and ash residue.

The air quality monitoring system also has six HVAS that monitor concentrations of smaller dust particles (typically <50µm), which are airborne (*suspended particles*) for a period of 24 hours on every sixth day. Three of the HVAS used by the Bulga Coal Complex record Total Suspended Particulates (TSP), whilst five record Particulate Matter less than ten microns in diameter (PM<sub>10</sub>). All samples collected from HVAS are analysed by a National Association of Testing Authorities (NATA) approved laboratory.

The Bulga Coal Complex also shares monitoring results with Mount Thorley Operations. These results are collected from two Dust Deposition Gauges, two HVAS measuring TSP, and two HVAS measuring PM<sub>10</sub>. The results supplement the Bulga Coal Complex air quality monitoring system.

All air quality monitoring for the Bulga Coal Complex is undertaken by qualified consultants in accordance with:

- AS 2724.3 – 1984 Ambient Air – Particulate Matter – Determination of Total Suspended Particulates (TSP) – High Volume Sampler Gravimetric Method; and
- AS 3580.10.1 – 2003 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

### Control Strategy

A variety of control strategies have been implemented at the Bulga Complex to manage air quality during the reporting period. These controls have been undertaken in accordance with the Bulga Coal Complex Dust Management Plan. Control strategies include:

- Operation of dust suppression sprays on ROM coal stockpiles;
- Operating sprinklers at conveyor transfer points;
- Rehabilitation of disturbed areas as soon as practicable following completion of construction works;
- Restricting blasting activities to suitable weather conditions;
- Graveling of hardstand areas;
- Ensuring that all vehicle operators are aware that speed limits apply within the Bulga Coal Complex through signage and the induction process;
- Regular grading of roads;
- Progressive shaping and rehabilitation of overburden dumps to minimise the area exposed to wind;
- Ensure that mine site traffic is kept to well defined routes on properly formed roads whenever possible;
- Minimising areas of pre-stripped land;
- Use of dust controls on drills and coarse materials for stemming and blasts;
- Dust minimisation training during the environmental site induction; and
- Regular watering undertaken on unsealed roads and hardstand areas subject to extended dry or high wind conditions.

### Variations from Control Strategy/s

Control strategies implemented at the Bulga Coal Complex during the reporting period have not varied from those proposed in the 2009 AEMR. All strategies listed above in **Section 3.5.1** have been conducted in accordance with the Bulga Coal Complex Dust Management Plan.

## 3.5.2 Environmental Performance

### Results

Air Quality monitoring undertaken during the reporting period has been summarised below in **Table 3.3**. Further detailed information pertaining to air quality monitoring and assessment undertaken at the Bulga Coal Complex has been provided in **Appendix E** and **F**.

It should be noted that the air quality monitoring locations are divided into those on mine owned land around the operations ('onsite locations') and offsite locations. As required by development consent conditions, an exceedance is reported if it occurs at an offsite location.

**Table 3.3 Summary of Dust Deposition Monitoring Results; Annual Averages**

GAUGE		IM Deposited (g/m <sup>2</sup> /30 mth)	Ash Deposit (g/m <sup>2</sup> /mth)	Consent Criteria (g/m <sup>2</sup> /mth)
Code	General Location			
<b>Offsite</b>				
A3	Inlet Road	1.6	1.2	4
C5	Mount Eyre Vineyard	1.7	0.8	3.2
D2	Bulga CHPP lab	2.6	1.6	4
D6	Howe Street	1.7	0.9	3.3
D9	Inlet Road	1.6	0.9	3.2
D10	Putty Road	1.4	0.8	3.6
E1	Track FB 12	4	2.3	3.7
E2	Track FB 12	2.5	1.6	4
E3	Track FB1	1.5	0.8	3.5
N5	Putty Road	1.2	0.8	3.6
Redibar	Redibar	0.9	0.5	4
Sharrock 1	Sharrock	0.9	0.5	4
<b>Onsite</b>				
A1	Charlton Road	2.1	1.2	N/A
A2	Billy Balls lane	1.9	1.3	N/A
B2	L1 access gate	2.1	1.6	N/A
B3	Broke Road	1.5	0.8	N/A
C1	Crib Hut 1	5.4	3.4	N/A
C2	Broke Road	10.1	8	N/A
C3	Broke Road	3.2	2.1	N/A
C4	Broke Road	3	2.3	N/A
D3	Bulga Haul Road	6.7	4.3	N/A
D5	Broke Road	2.2	1.2	N/A
D7	Billy Balls lane	1.8	1.1	N/A
F1	The Groves' property	2.2	1.2	N/A
F2	Charlton gate	2.1	1	N/A
F3	Fordwich Road	1.2	0.7	N/A
L1	Charlton Road	1.5	0.9	N/A
N3	Charlton Road	3.5	2.7	N/A
N4	Bulga Mine Entry Road	4.7	3.9	N/A
N6	Hope Estate Winery	2.7	1.4	N/A

During the reporting period, the year to date averages for all offsite monitoring locations complied with and remained below annual average criteria, with the exception of E1.

A summary of HVAS monitoring results for the reporting period has been provided below in **Table 3.4**. This table demonstrates annual averages for PM<sub>10</sub> and TSP associated with operations at the Bulga Coal Complex. HVAS raw data which has been recorded every sixth day throughout the 2010 reporting period has been provided in **Appendix F**.

**Table 3.4 Summary of High Volume Air Sampling Results; Annual Averages**

Gauge	PM10	TSP	99 percentile	98.6 percentile
Bulga	–	75.9	–	–
H1	27.2	–	66.4	66.2
Beltana	13	–	41.1	39.3
Dawtreay	12.8	26.9	48.4	46.1
D10	12.8	29.2	46.2	44.7

Annual averages for all gauge locations were in compliance with the annual average criteria of  $30\mu\text{g}/\text{m}^3$  and  $90\mu\text{g}/\text{m}^3$  (100<sup>th</sup> percentile) for  $\text{PM}_{10}$  and TSP respectively.

There have been no exceedances of the long term impact assessment criteria for particulate matter or the long term land acquisition criteria for particulate matter.

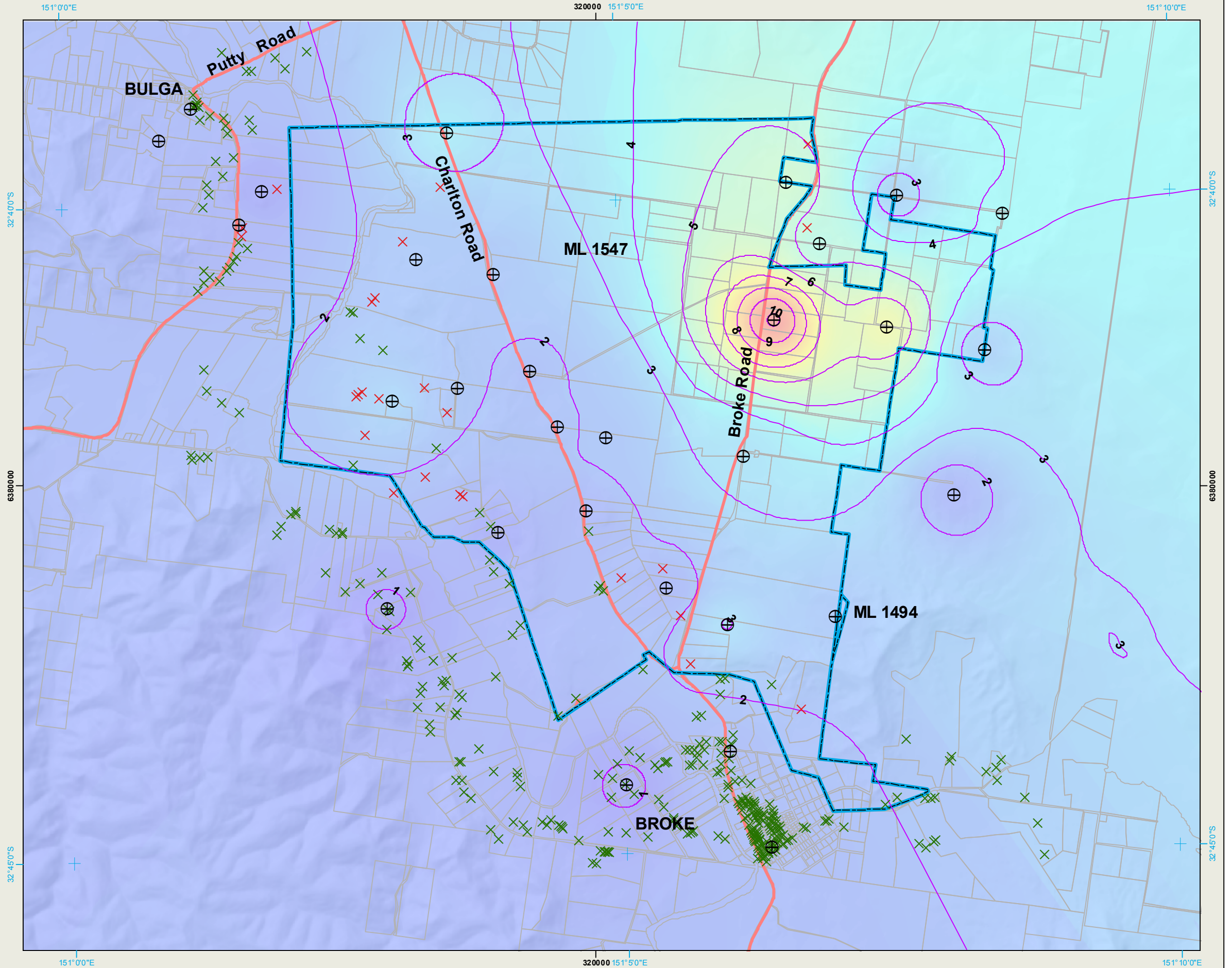
### Performance Outcomes

Monitoring data recorded at the Bulga Coal Complex during the reporting period has shown that cumulative air quality complies with the maximum 24-hour  $\text{PM}_{10}$  criteria referred to in the approval. There was one exceedance associated with depositional dust at gauge E1. The year to date annual average at E1 was  $4\text{g}/\text{m}^2/\text{month}$ , which exceeded the adopted incremental dust criteria of  $3.7\text{g}/\text{m}^2/\text{month}$ . This gauge is located east of the Bulga Surface Operations on federally owned defence land; there are no residential sensitive receptors at this location, or within several kilometres. Whilst this site is not 'privately owned' land, E1 is monitored as part of the Bulga Coal Complex 'offsite' monitoring network for neighbouring properties. The elevated levels monitored in E1 were as a result of the construction of the CHPP 3,000 ML mine water storage dam located immediately adjacent to the gauge as shown in **Figure 1.2** and **Figure 3.2**.

During 2010 the second of the two ventilation fans was commissioned at Blakefield South. As per Condition 4.27 of the Underground Operations DA 376-8-2003 ventilation shaft monitoring was undertaken and the results sent to the DECCW. The measured dust concentration of  $1.1\text{ mg}/\text{m}^3$  was marginally greater than assumed in the 2007 Statement of Environmental Effects ( $1.0\text{ mg}/\text{m}^3$ ); however the mass rate of emission of  $0.154\text{g}/\text{s}$  is around one quarter of the rate estimated in the 2007 Statement of Environmental Effects (SEE) and therefore the emissions are also about one quarter. Therefore, the emissions comply with the intent of Condition 4.28 of DA 376-8-2003.

The 2007 SEE also applied an odour emission concentration level of 170 OU for underground ventilation shafts, and a volumetric flow rate of  $580\text{m}^3/\text{s}$ . The odour level measure from the second ventilation fan was 43 OU and a volumetric flow rate of  $140\text{m}^3/\text{s}$ , both of which are well below the levels included in the SEE and comply with Condition 4.28 of DA 376-8-2003.

# Figure 3.5 DEPOSITIONAL DUST ISOPLETHS



**MINING LEASES**

- ⊕ Depositional Dust Monitoring Site

**Sensitive Receptor**

- × Bulga Ownership
- × Private Ownership
- Depositional Dust Isopleth ( $g/m^2/month$ )
- Road
- ▭ Cadastre

**Depositional Dust ( $g/m^2/month$ )**

High : 10.1

Low : 0.9

**DISCLAIMER**

Xstrata Coal NSW makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.

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0 0.5 1 2  
Kilometres

1: 55,000 @ A4  
Coordinate System: MGA (GDA 94) Zone 56

xstrata coal BELTANA BULGA COAL

### 3.5.3 Incidents and Improvements

There were no dust related incidents recorded at the Bulga Coal Complex during the 2010 reporting period. However, there were two dust related complaints that were received by the Bulga Surface Operations. Consultation was undertaken in relation to these complaints. One complaint was the result of unusually high wind being experienced throughout the Hunter Valley. Bulga Underground Operations received the second complaint, consultation was undertaken and an investigation was completed.

The elevated TSP levels monitored in E1 are very difficult to avoid given the very close proximity of the CHPP Surge Dam construction which is only 300m from the monitoring site. Dust levels at E1 are expected to improve with the completion of dam construction. Dust mitigation measures implemented during the construction of the dam include watering traffic areas, ceasing operations during high wind conditions and vegetation of completed external embankments.

Based upon monitoring results obtained during the 2010 reporting period, air quality control strategies implemented at the Bulga Coal Complex have appeared to be adequate. Improvements to dust management practices proposed for the 2011 reporting period include;

- Implementation of a real time dust monitoring network;
- Review and implementation of dust suppressants in active areas;
- Implementation of a dust surveillance network;
- Temporary rehabilitation programs to minimise disturbance; and
- Investigation into potential in-pit irrigation systems.

## 3.6 Surface Water

### 3.6.1 Environmental Management

#### Monitoring System

Monitoring of surface water quality is undertaken at locations throughout the Bulga Coal Complex and surrounding catchment area. Surface water monitoring sites are sampled on a monthly basis and include streams, creeks and dams. Water is collected using an extendible water sampler and is transferred into bottles for analysis. Water quality parameters including temperature and depth are tested onsite, whilst others including pH, electrical conductivity (EC) and total suspended solids (TSS) are undertaken by a NATA accredited laboratory.

Monitoring locations have been selected to effectively obtain representative samples associated with the following:

- Water quality in the natural water courses surrounding the Bulga Coal Complex mining operations;
- Water quality associated with the Hunter River Salinity Trading Scheme (HRSTS) licensed discharge point.

Surface water quality monitoring is conducted at the Bulga Coal Complex in accordance with the following:

- AS 5667.4 – 1998 Water Quality Sampling – Guidance on Sampling from Lakes, Natural and Man-made;
- AS 5667.6 – 1998 Water Quality Sampling—Guidance on Sampling of Rivers and Streams; and
- The Bulga Coal Complex Water Management Plan.

#### Control Strategy

Bulga Coal Complex implements all surface water management measures in accordance with the approved Site Water Management Plan (SWMP) (Bulga Coal Complex, 2008). These control strategies

outline procedures for the detection of significant off-site impacts, if any, which occur as a result of mining. The SWMP also outlines trigger levels to effectively identify and then manage potentially adverse impacts. Trigger levels are calibrated into the site Environmental Monitoring Database, which generates an alarm if a trigger level is reached or exceeded.

The SWMP further outlines the methods for monitoring the quantities of water that are extracted, imported or discharged under the various licences, including groundwater extraction licences, surface water extraction licences and discharge under the Hunter River Salinity Trading Scheme (HRSTS).

### Variations from Control Strategy/s

During the reporting period the SWMP and Erosion and Sediment Control Plan were revised and submitted for approval to the DoP, DII, DECCW and the NSW Office of Water (NoW) as required by the November 2009 Development Consent modification. These modified plans included variations to control strategies consistent with those identified above and those that are accepted industry practise. Once consultation is received from the various departments and approval is obtained from the NSW Department of Planning the Bulga Coal Complex SWMP and Erosion and Sediment Control Plan will be made available on the Bulga Coal Complex website.

### 3.6.2 Environmental Performance

The implementation of the various management measures and the monitoring system have effectively resulted in the Bulga Coal Complex having no surface water related exceedances during the 2010 reporting period.

#### Results

A summary of surface water monitoring results recorded at the Bulga Coal Complex during the reporting period have been provided below in **Table 3.6**. The location of surface water monitoring sites is shown on **Figure 3.7**. Further monitoring data has been provided in **Appendix G**.

**Table 3.6 Summary of Surface Water Monitoring Results; Annual Averages**

Sample Point	pH (range)	EC (µS/cm)	TSS (mg/L)	Temp. (°C)	Depth (m)	Oil & Grease (mg/L)
LR1	7.0 - 8.3	678.3	15.1	19.1	0.2	0.0
LR2	7.6 - 8.2	4823.3	19.3	19.9	0.1	0.0
LR5	7.1 - 8.1	717.5	25.0	21.1	0.2	0.0
W2	7.1 - 7.9	654.3	5.6	19.8	0.2	0.0
W4	6.9 - 8.1	657.5	6.3	22.1	0.1	0.0
W8	7.7 - 8.9	9953.3	29.8	17.1	0.3	0.0
Annual Overall	n/a	2926.7	58.2	18.2	0.7	6.8

As documented in **Table 3.6**, monitoring of surface water quality during the reporting period was undertaken for a variety of parameters. Results for the Bulga Coal Complex remained within historical ranges at all monitoring locations with the exception of two elevated results for TSS. These results were recorded at LR5 and W8.

The elevated result at LR5 was recorded in March. This sample was taken from a shallow pool of water as a result of no surface flow at this time. Elevated TSS may be a direct result of concentrated pooled water.

Samples taken after this spike have demonstrated that the TSS level has returned to previously observed levels.

Elevated TSS was recorded at W8 in November of the reporting period. This result was recorded following levels of high rainfall in the preceding days which is likely to have flushed (normally) ponded sediments in the ephemeral stream.

During the reporting period, controlled water discharges from the Bulga Coal Complex were undertaken in accordance with relevant assessment criteria. Criteria used to estimate whether water was able to be discharged and the volume of water able to be discharged in a single event included EC, pH and TSS.

### Hunter River Salinity Trading Scheme (HRSTS)

Discharges occurring under the Hunter River Salinity Trading Scheme are licensed at three separate locations on site, these being Dam 3 (Swan Lake), Fill Point 2 (Dam 9) and Dam 13. Discharges during 2010 were released exclusively from Swan Lake. The EPL for the Bulga Coal Complex requires the discharge from the dams to be monitored during discharge events.

The EPL requires that Bulga Coal Complex monitors for pH and TSS on all discharges. The EPL stipulates criteria for pH (6.5–9.5) and TSS (120 mg/L).

There were fifteen discharge events from Dam 3 (Swan Lake) during the reporting period, with discharges occurring throughout the year (July, August, November and December). The limit of 55ML/day was not exceeded during the reporting period, with discharges remaining well below the criteria (maximum of 22.6ML/day). TSS and pH levels in all discharges were compliant with the required criteria. Monitoring data for each discharge event during 2010 is provided in the **Table 3.7** below.

**Table 3.7 - HRSTS Water Quality Monitoring Results**

Date	pH	TSS/NFR (mg/L)	Volume Discharged (ML)
15/07/2010	9.36	31	15.6
16/07/2010	9.39	31	17.5
18/07/2010	9.34	40	17.6
1/08/2010	9.15	37	6.5
2/08/2010	9.08	41	13.6
3/08/2010	9.05	19	16.6
4/08/2010	9.13	38	10.5
5/08/2010	8.99	40	10.1
6/08/2010	8.98	58	14.4
7/08/2010	8.81	71	14.7
17/11/2010	9.07	42	13.7
18/11/2010	9.20	47	22.6
19/11/2010	9.30	44	9.8
02/12/2010	9.35	51	21.6
07/12/2010	9.20	45	20.0

## Performance Outcomes

The monitoring system and management measures implemented in accordance with the approved Site Water Management Plan have resulted in no surface water exceedances at the Bulga Coal Complex for the 2010 reporting period.

### 3.6.3 Incidents and Improvements

No surface water related incidents were recorded at the Bulga Coal Complex during the reporting period. There was no identified requirement for the improvement of surface water management practices.

## 3.7 Erosion and Sediment

### 3.7.1 Environmental Management

#### Monitoring System

Monitoring and inspections at the Bulga Coal Complex are completed in accordance with the Bulga Coal Complex Erosion and Sediment Control Plan, which is incorporated into the Bulga Coal Complex Site Water Management Plan. This system is designed to comply with EPL No. 563 and the erosion and sediment control conditions stipulated within the Bulga Coal Complex development consent. Monitoring and Inspections associated with Erosion and Sediment Control include the following:

- Regular surface water monitoring in accordance with Bulga Coal Complex Site Water Management Plan;
- Monthly Environmental Inspections;
- Completion criteria monitoring;
- Subsidence monitoring in accordance with approved SMP; and
- Event based inspections based on rainfall intensities.

#### Control Strategy

A variety of control strategies have been applied at the Bulga Coal Complex during the reporting period to effectively mitigate operational risks associated with erosion and sediment control.

Erosion and sedimentation controls for the Bulga Coal Complex have been achieved by implementing the following key principles:

- Conducting best practice land clearing procedures for all proposed disturbance areas including:
  - Coordinating mining sequences to minimise exposure of disturbed soils to the elements; and
  - Topsoil stripping procedures to reduce deterioration in topsoil quality and dust generation.
- Appropriate storage of topsoil stockpiles in areas away from roadways and other drainage lines;
- Appropriate design of Fire Trails, Access Tracks and Haul Roads;
- Use of diversion structures to separate 'clean' water runoff from disturbed areas runoff, to minimise volumes of sediment-laden and mine water for management;
- Ensuring sediment-laden runoff is treated via designated sediment control devices;
- Revegetation of disturbed areas as soon as possible following the completion of construction activities;
- Temporary erosion and sediment controls to be in place prior to any construction activity outside of an existing dirty water management system;
- Subsidence impacts to be remediated to address erosion issues as a result of subsidence; and

- Implementing an effective maintenance program for the site.

### Variations from Control Strategy/s

As previously stated in **Section 3.6.1**, during the reporting period the SWMP and Erosion and Sediment Control Plan were revised and submitted for approval to the DoP, DII, DECCW and the NSW Office of Water (NoW) as required by the November 2009 Development Consent modification. These modified plans included variations to control strategies consistent with those identified above and those that are accepted industry practise. Once consultation is received from the various departments and approval is obtained from the NSW Department of Planning the Bulga Coal Complex SWMP and Erosion and Sediment Control Plan will be made available on the Bulga Coal Complex website.

## 3.7.2 Environmental Performance

### Results

Inspections were conducted following rainfall events. Any issues observed during these events were subsequently assigned corrective actions. Examples of these corrective actions completed in 2010 include;

- Rehabilitation of a 7ha area of the North Blakefield Dump;
- Stabilisation of various sediment dams; and
- Commencement of a hydramulching campaign across the site.

As referred to in **Section 3.6**, during the reporting period higher TSS levels were associated with internal onsite dams, which are the primary catch area points within the disturbed areas. Other dams in undisturbed areas were also monitored and compared against the 50mg/L limit in the *Managing Urban Stormwater: Soils and Construction Manual* and background levels contained in the relevant Environmental Assessments.

### Performance Outcomes

The implementation of the monitoring system and associated management measures implemented in accordance with the approved Site Water Management Plan and Erosion and Sediment Control Plan have resulted in no erosion and/or sediment control related exceedances at the Bulga Coal Complex for the 2010 reporting period.

## 3.7.3 Incidents and Improvements

No surface water related incidents were recorded at the Bulga Coal Complex during the reporting period. There was no identified requirement for the improvement of erosion and sediment control practices.

## 3.8 Groundwater

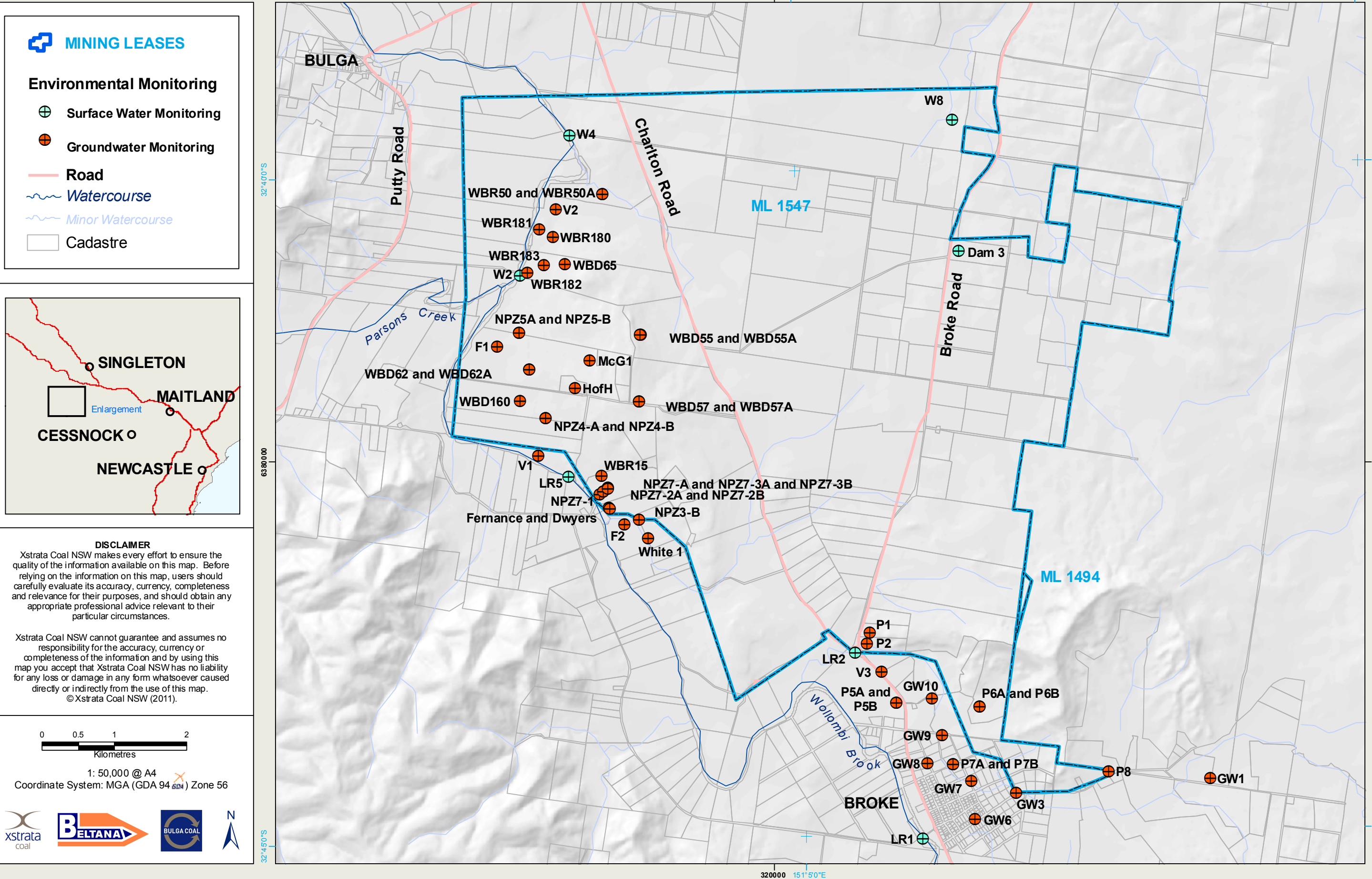
### 3.8.1 Environmental Management

#### Monitoring System

The Bulga Coal Complex groundwater monitoring system monitors a total of 46 piezometers the location of which is shown in **Figure 3.7**. Monitoring is undertaken bimonthly to determine a variety of water quality parameters and depth to water. Water samples are collected using a PVC bailer and are then transferred into bottles for analysis. Field measurements are duplicated from separate bailed samples to ensure that results are constant. Water quality parameters tested onsite include temperature, odour, turbidity and colour. Testing of EC and pH are conducted by NATA accredited laboratories.

Groundwater inflows to the underground operation are evaluated on a monthly basis and compared against the groundwater model predictions. If the groundwater inflows were to be inexplicably different to the

# Figure 3.7 BULGA COAL COMPLEX WATER QUALITY MONITORING SITES



groundwater model predictions investigations and or corrective actions would be initiated. The groundwater inflows to the underground operation during 2010 shown in **Table 2.2** are consistent with the model predictions of approximately 1.2 ML/month.

The groundwater monitoring system is designed to effectively monitor the two general types of groundwater located within the vicinity of the Bulga Coal Complex. These groundwater resources are the alluvial aquifers of Wollombi Brook and Monkey Creek Place, and the typically saline and low yielding hard rock aquifers associated with the Whittingham and Wollombi Coal Measures (various coal seams within these).

Groundwater monitoring at the Bulga Coal Complex is undertaken in accordance with the following:

- AS 5667.11 – 1998 Water Quality Sampling – Guidance on Sampling of Ground Waters; and
- The Bulga Coal Complex Water Management Plan.

### Control Strategy

Mapping of the deep and shallow depressurisation of the hard rock (coal measures) strata is undertaken to identify the potential for any adverse impacts on the shallow alluvial aquifer systems associated with Wollombi Brook and Monkey Place Creek. Depressurisation is predicted within the coal measures on a regional scale; however, it is expected to induce very small rates of vertical leakage from the alluvial aquifers due to the low hydraulic conductivities of the strata within the coal measures.

The purpose of the groundwater monitoring program is to generate data to facilitate depressurisation mapping in greater detail. Activity can be halted if mapping shows that mining operation is likely to cause, or is causing, adverse impacts.

### Variations from Control Strategy/s

There were no variations associated with the implementation of groundwater control strategies at the Bulga Coal Complex during the 2010 reporting period.

## 3.8.2 Environmental Performance

### Results

A summary of groundwater monitoring results recorded for the Bulga Coal Complex during the 2010 reporting period is provided in **Table 3.8**. Further monitoring data regarding groundwater quality at the complex has been provided in **Appendix H**.

**Table 3.8 Summary of Groundwater Monitoring Results; Annual Averages**

Site	Depth To Water (m)	Water Elevation (mAHD)	pH (range)	EC (µS/cm)
<b>Broke Area Alluvials</b>				
GW1	4.5	87.8	6.83 - 7.54	2248.3
GW3	2.2	75.8	6.48 - 7.04	5880.0
GW6	2.9	74.1	7.13 - 7.77	7623.3
GW7	1.5	73.6	6.52 - 7.38	3625.0
GW8	3.4	71.8	6.41 - 7.1	5935.0
GW9	2.0	71.8	6.42 - 7.16	3356.7
GW10	1.5	71.8	7.22 - 8.08	6498.3
V3	6.6	68.9	7.05 - 7.98	1533.8

Site	Depth To Water (m)	Water Elevation (mAHD)	pH (range)	EC (µS/cm)
<b>Broke Area Wollombi Seam</b>				
P5A	6.29	69.86	8.04 - 8.32	6215.00
P6A	10.22	74.89	7.8 - 8.3	2616.67
P2	5.48	69.12	7.65 - 8.3	13200.00
<b>Northern Area Shallow Alluvials</b>				
V2	7.0	60.3	6.49 - 7.77	167.2
V1	7.0	64.0	7.25 - 8.13	1586.7
WBR50A	4.1	61.0	7.14 - 7.49	13500.0
F1	6.6	63.5	7.24 - 7.61	841.2
F2	5.2	64.9	7.07 - 7.42	1605.0
<b>SBC/Broke Area Lower Whybrow Seam</b>				
P1	19.1	62.9	7.65 - 8.31	14400.0
P6B	26.4	58.7	6.54 - 7.39	634.0
P5B	Insufficient data			
P8	Insufficient data			
<b>Northern Area Lower Whybrow Seam</b>				
WBR50	31.6	32.9	6.54 - 7.11	357.8
WBR15	15.4	62.7	6.82 - 7.29	918.7
WBD62	Insufficient data			
<b>Northern Alcheringa Seam</b>				
WBD62A	17.2	63.0	6.84 - 7.94	1002.8
<b>Beltana Area Miscellaneous Bores and Wells</b>				
Dwyers	8.4	61.7	7.13 - 7.46	1331.7
Fernance	8.5	63.1	7.16 - 7.6	1423.3
McG1	20.0	92.4	7.56 - 8.23	499.8
White1	5.4	65.2	7.16 - 8.17	2203.3
<b>Beltana Area NPZ</b>				
NPZ3-A	16.6	56.6	7.71 - 7.81	1552.0
NPZ3-B	10.5	62.2	7.27 - 8.2	861.0
NPZ4-A	22.2	60.5	6.87 - 7.91	710.5
NPZ4-B	36.4	45.6	7.58 - 8.41	1391.7
NPZ5-A	11.1	63.4	6.92 - 7.49	850.7
NPZ5-B	32.3	41.6	7.27 - 7.86	2591.7
NPZ7-1	9.5	59.5	7.44 - 8.39	1256.7
NPZ7-2A	7.6	63.0	7.03 - 7.81	1781.7
NPZ7-2B	13.2	57.0	7.46 - 8.33	961.5
NPZ7-3A	11.0	62.9	7.1 - 7.92	1983.3
<b>Wollombi Alluvials and Shallow Coal Measures</b>				
WBR180	26.4	43.5	7.05 - 7.56	18516.7
WBR181	7.6	60.9	7.14 - 7.63	2453.3
WBR182	7.1	62.5	7.9 - 8.55	1331.7
WBR183	14.2	60.4	6.97 - 7.43	2746.7
WBD160	9.3	64.6	6.78 - 7.55	1263.3

Results recorded during the reporting period have demonstrated that pH and EC were generally within the range of observed historical results at all monitoring locations. None of the impact triggers, contained in the approved Bulga Coal Complex Environmental Monitoring Program, were reached.

Depth to water values were generally consistent with historical ranges at all monitoring locations throughout the Bulga Coal Complex with the exception of WBR180 (shallow coal measures). This monitoring location experienced a predicted increase in depth to water as a result of the mining of longwall 13 at Beltana No. 1.

No adverse impacts on the alluvial aquifer systems have been identified to date.

### Performance Outcomes

The implementation of management measures and the groundwater monitoring system in accordance with the approved Water Management Plan has effectively resulted in no groundwater related exceedances during the reporting period. Additional to the summary in this report an independent groundwater assessment for Beltana Longwall Panel 14 and Blakefield South Longwall Panel 1 was undertaken by RPS Aquaterra (Apr 2011), a copy of which is included in **Appendix I**.

#### 3.8.3 Incidents and Improvements

During the reporting period there were no recorded groundwater related incidents at the Bulga Coal Complex. No requirement was identified for improvement to currently implemented groundwater management practices.

### 3.9 Mine Subsidence

#### 3.9.1 Environmental Management

Extraction of the Beltana seam for 2010 included Longwalls 12 and 13, and approximately 40% of Longwall 14. The depth of cover above these longwalls ranged from 180m at the end of Longwall 13, to 40m at the start of Longwall 12 and 13 with a seam thickness between 2.5m and 3.5m.

Extraction of the Blakefield South seam commenced on 18/06/2010 in Longwall 1 and the first panel is approximately 50% complete. The depth of cover ranged from 215m to 170m with a seam thickness between 2.2m and 3.6m.

A variety of subsidence related scenarios occurred during the reporting period, including undermining the following:

- Charlton Road at the commencement of Blakefield South Longwall 1;
- A privately owned property at the commencement of Blakefield South Longwall 1;
- The Northern Drainage Line (NDL) at Beltana Longwall 12 and 13;
- The mine-owned Olive Grove at Beltana Longwall 12; and
- Fibre optic cables, power lines and pipelines (both mine-owned and public infrastructure).

**Figure 3.9A** and **3.9B** illustrate the areas subject to undermining in 2010.

### Monitoring System

Subsidence monitoring is conducted pre-mining, during and post-mining. The determination of surface conditions is made with surveys and photographs, and includes the condition and height of dam walls, the nature of watercourse flows and the extent and nature of surface cracking above areas recently undermined. Approved survey lines are also monitored and compared to predictions of total subsidence, tilts and strains. Cracking and sinkholes are captured using a GPS camera and are maintained in a site database for future reference.

Subsidence monitoring during 2010 was undertaken in accordance with the following:

- Beltana Subsidence Monitoring Plan Longwall 12 – 14; and
- Blakefield South Longwall 1 – 6 Subsidence Monitoring Program.

During 2010, real-time survey monitoring was introduced to the Underground Operations. Over Blakefield South Longwall 1 three lines using a real time monitoring system were installed. This was undertaken to assist in determining the rate at which subsidence takes place, which in turn will assist with the management of subsidence impacts on public roads. One line (MP) was installed directly above the chain pillar between South Bulga Whybrow Longwall 3 and 4, which is equivalent to the current Broke Road alignment. The remaining two lines (MX and MY) were installed perpendicular to the MP line. Measurements were taken every 20 minutes from 24/10/2010 to 03/01/2011. The system has since been decommissioned.

Daily monitoring of surface cracking was undertaken during and after mining. All subsidence cracking is mapped against air-photos in the field and digitised into the site Geographic Information System (GIS) with associated attributes on the type and size of damage. Where subsidence damage is significant enough to warrant repairs, information on the repair methodology and materials used is also recorded in the GIS.

### Control Strategy

Control strategies implemented to manage subsidence related impacts at the Bulga Underground Operations have been undertaken in accordance with the approved Subsidence Management Plans. These plans are available for download at <http://www.beltanaoperations.com.au> and <http://www.bulgacoal.com.au>. During the reporting period there were no variations from the subsidence control strategies being implemented at the Bulga Coal Complex.

## 3.9.2 Environmental Performance

### Results

The maximum observed subsidence along the MP Line was 1920mm, representing approximately 70% of the extraction height for Blakefield South Longwall 1. The rate of subsidence development was relatively smooth, with no major stepping or jumping observed. The maximum rate of subsidence was 440mm/day, or 18.3mm/hr, measured at a location which had been mined approximately 75m beyond the survey station.

**Table 3.9** and **Table 3.10** below compare the results of subsidence monitoring against the predicted levels for Beltana and Blakefield South respectively. Survey data collected during 2010 on 6 lines over Beltana and 8 over Blakefield South was supplied to Mine Subsidence Engineering Consultants (MSEC) to evaluate the observed subsidence and provide expert opinion as to the accuracy of the predictions and adequacy of the management strategies in place. For further details, refer to **Appendix J**.

**Table 3.9 Subsidence, Tilt and Strain over the Whybrow Seam**

Monitoring Line	Longwall	Type	Maximum Incremental Subsidence (mm)	Maximum Incremental Tilt (mm/m)	Maximum Incremental Tensile Strain (mm/m)	Maximum Incremental Compressive Strain (mm/m)
Line 13	13	Observed	1669	24	12	17
		Predicted	2000	37	8	14
Line 13A	13	Observed	1680	31	9	26
		Predicted	2000	30	8	6

Monitoring Line	Longwall	Type	Maximum Incremental Subsidence (mm)	Maximum Incremental Tilt (mm/m)	Maximum Incremental Tensile Strain (mm/m)	Maximum Incremental Compressive Strain (mm/m)
Line 13C	13	Observed	1412	>100	35	32
		Predicted	1650	65	30	40
Line 13-XLCR	13	Observed	1337	50	11	7
		Predicted	1650	75	50	45
Line 14	14	Observed	1164	30	7	8
		Predicted	2200	60	20	25
Line 14A	14	Observed	531	13	2	3
		Predicted	2200	40	12	9

Table 3.10 Subsidence, Tilt and Strain over the Blakefield Seam

Monitoring Line	Longwall	Type	Maximum Incremental Subsidence (mm)	Maximum Incremental Tilt (mm/m)	Maximum Incremental Tensile Strain (mm/m)	Maximum Incremental Compressive Strain (mm/m)
Charlton Road Line	1	Observed	2401	47	13	10
		Predicted	2800	90	50	50
DL Line	1	Observed	2518	55	18	14
		Predicted	2550	100	50	75
Fordwich Road Line	1	Observed	<20 (Subsidence) 36 (Net Uplift)	1	6	2
		Predicted	<20	<1	<0.5	<0.5
LOM Line	1	Observed	2563	44	18	31
		Predicted	1700	90	55	55
MG1CP Line	1	Observed	433	11	3	4
		Predicted	200	1	<0.5	<0.5
ML1 Line	1	Observed	2683	65	11	19
		Predicted	3400	60	30	30
SBCP1 Line	1	Observed	2070	30	5	19
		Predicted	250	50	20	20
XL1 Line	1	Observed	2469	61	23	11
		Predicted	2800	>100	60	90

The observed maximum incremental subsidence for Beltana Longwall 13 and 14 generally showed good correlation with the predicted values. Irregular subsidence, tilt and strain was observed under shallow depths of cover and on some occasions exceeded the predicted values, however such an occurrence has been acknowledged in the Underground Operations EIS and SMP Application and can be expected in

shallow mining conditions. A comparison between Longwall 14 monitoring lines was difficult as longwall extraction was continuing beneath these lines, and the full subsidence had not yet developed.

The observed maximum incremental subsidence for Blakefield Longwall 1 is generally within the range of movements predicted. Observed exceedances of the predicted subsidence, tilt and strain were either isolated local occurrences or outside of the main gate edge of the longwall. Observed subsidence varied along the lengths of the monitoring lines due to the multi-seam nature of the mining, with locally increased subsidence observed adjacent to the overlying Whybrow chain pillars, and locally decreased subsidence observed above the Whybrow chain pillars.

The observed incremental subsidence for the real time monitoring lines were within the range of predicted values over the length of the monitoring line, with isolated local exceedances. The majority of subsidence development was observed after the longwall face had progressed between 30m and 110m beyond the monitoring point, or between 0.15 and 0.65 times the depth of cover.

### Performance Outcomes

The effective implementation of management measures and the subsidence monitoring system has resulted in no subsidence related incidents or complaints during the 2010 reporting period. **Table 3.11** details management measures implemented during the reporting period in order to effectively manage subsidence related impacts at the Bulga Coal Complex.

**Table 3.11 Management Measures**

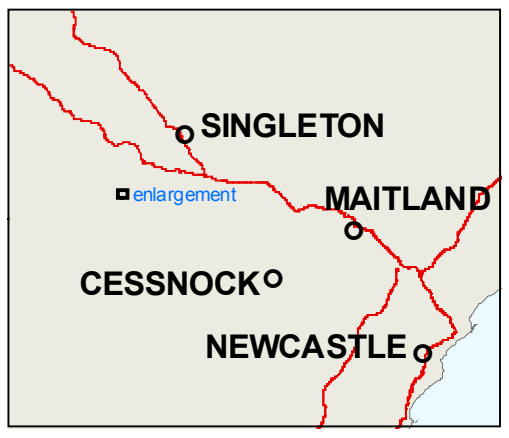
Surface Feature	Subsidence Impact	Action
Natural Features		
Northern Drainage Line (NDL)	Surface cracking	Repairs to surface cracks, no contouring work required at time of reporting
Southern Drainage Line (SDL)	Slight draining of dams and ponds	Rehabilitation and stabilisation designs for the SDL on the McInerney Property are currently being developed. Works will be completed in 2011
Man-Made Features		
Private residences	None	N/A
Private Infrastructure (sheds fences etc.)	Structural damage to fence and a shed tank	Fences were repaired and the tank replaced on McInerney Property to landholder's satisfaction
Land Use		
Grazing	Surface cracking	Repairs to surface cracks
Olive Grove	Minor surface cracking	No noticeable impacts to the health of trees and no action required
Public Utilities		
Public Roads	Camber from chain pillar on Charlton Road	Works were completed by September 2010 to reduce the camber on Charlton Road. Post subsidence inspections completed
Electricity	None	The 11kV power line was inspected prior to undermining, and rollers were installed to mitigate subsidence impacts. There was no damage to infrastructure
Telecommunications	None	HDPE conduit was installed to prevent pressure points and potential snapping of optic fibre cable. There was no damage to infrastructure
Water	None	Preparatory works for the replacement of the Private Irrigation District (PID) Pipeline commenced and works are expected to be completed during 2011, prior to undermining Broke Road

### **3.9.3 Incidents and Improvements**

No subsidence related incidents were recorded at the Bulga Coal Complex during the reporting period. Further to this no requirement for improvements relating to the management of subsidence related impacts has been identified.

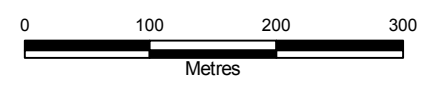
# Figure 3.9a SUBJECT TO UNDERMINING (WHYBROW SEAM)

-  Beltana Mine Workings
-  Area Undermined
-  Subsidence Repairs
-  Communications Service
-  Electrical Service
-  Mine Water Service
-  Optic Fibre Service
-  Gas Drainage Service
-  PID Service
-  Road
-  Private Properties

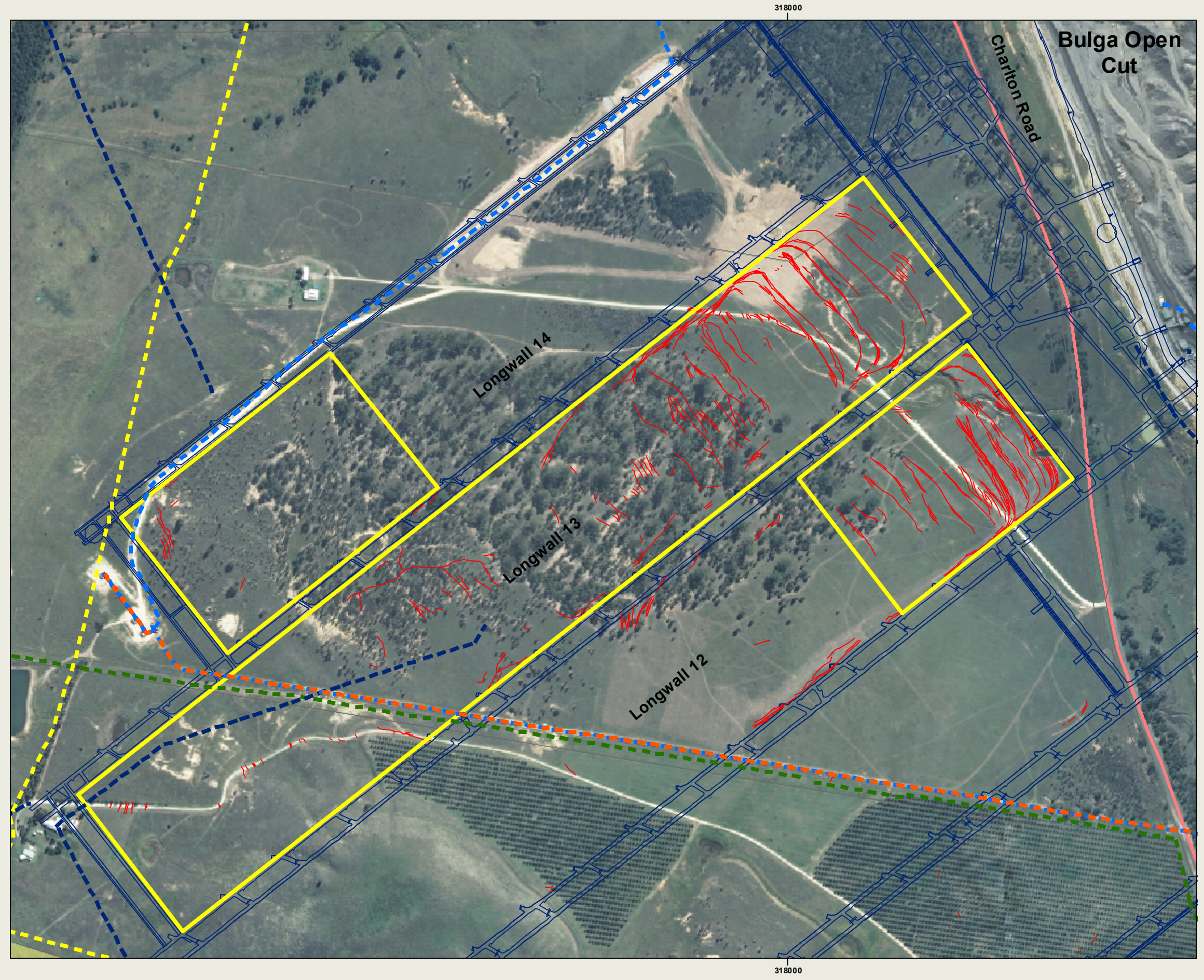


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Coordinate System: MGA (GDA 94) Zone 56



**Figure 3.9b**

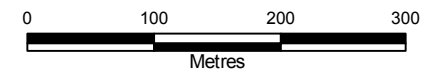
**SUBJECT TO UNDERMINING (BLAKEFIELD SOUTH SEAM)**

-  Blakefield South Mine Workings
-  Area Undermined
-  Subsidence Repairs
-  Communications Service
-  Electrical Service
-  Mine Water Service
-  Telstra Service
-  Optic Fibre Service
-  Gas Drainage Service
-  PID Service
-  Road
-  Private Properties

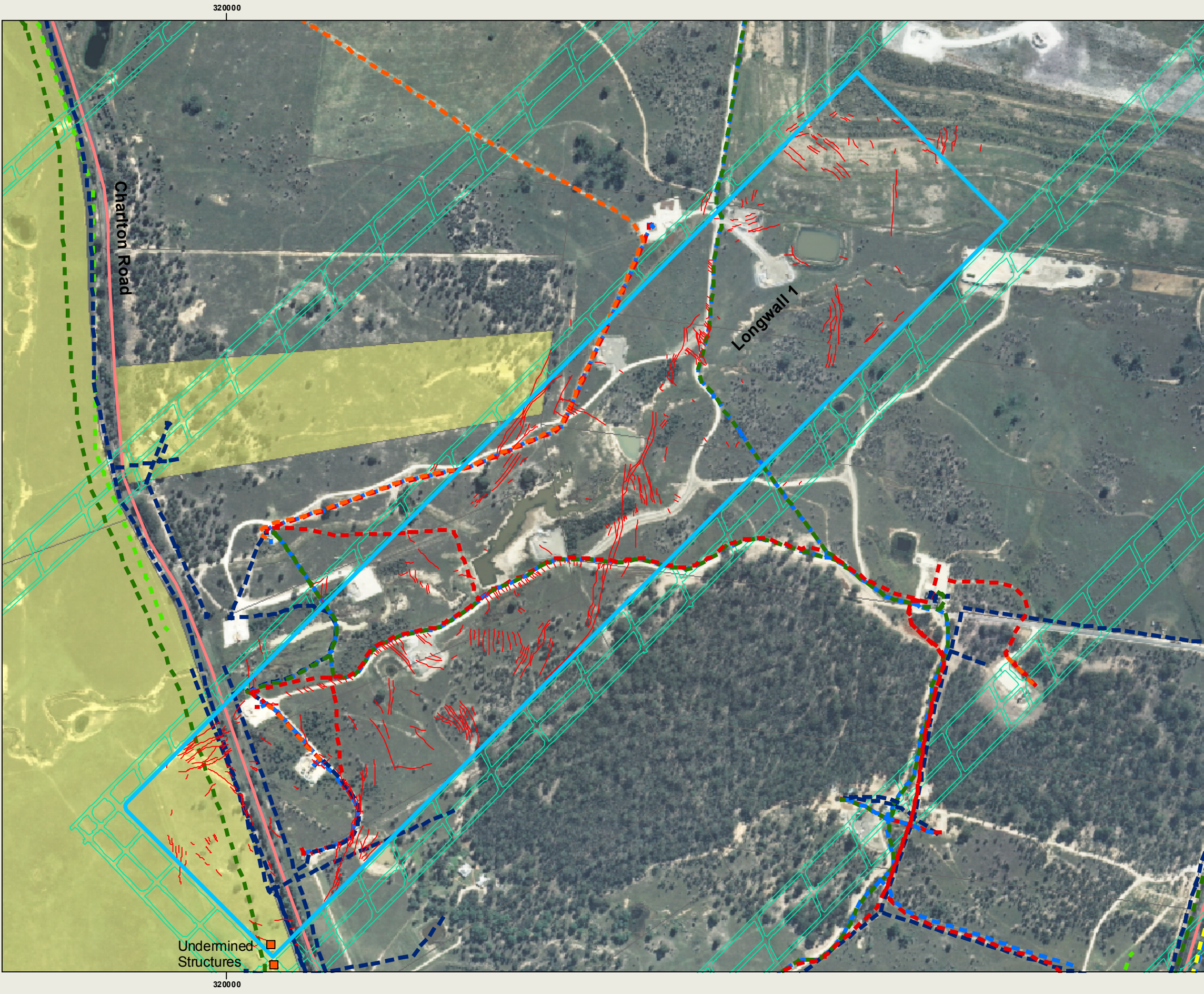


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## 3.10 Flora and Fauna Management

### 3.10.1 Environmental Management

#### Monitoring System

The Bulga Coal Complex conducts an annual ecological monitoring program to confirm the objectives of the Flora and Fauna management plan are being met and also to identify opportunities for improvement. Monitoring programs have been designed to effectively monitor onsite revegetation, surrounding vegetation, species diversity and riparian habitats. A detailed explanation of these monitoring systems has been provided below.

#### *Annual Ecological Monitoring Program – Flora*

The Annual Ecological Monitoring Program for flora was undertaken by DnA Environmental, who completed the monitoring using a combination Landscape Function Analyses (LFA), comprehensive soil analyses and an assessment of ecosystem characteristics using an adaptation of methodologies derived by the Biometric Model used in the Property Vegetation Planning Process (Gibbons et al 2008). The ecological assessment provides quantitative data that measures changes in:

- Floristic diversity including species area cover and growth forms;
- Ground cover diversity and abundance;
- Vegetation structure and habitat characteristics (including ground cover, cryptogams, logs, rocks, litter, projected foliage cover at various height increments);
- Understorey density and growth (including established shrubs, direct seeding and tubestock plantings and tree regeneration);
- Overstorey characteristics including tree density, health and survival; and
- Other habitat attributes such as the presence of hollows, mistletoe and the production of buds, flowers and fruit.

#### *Annual Ecological Monitoring Program – Fauna*

Ecological monitoring for fauna for the reporting period was completed by RPS and results produced in the 2010 Annual Ecological Monitoring Report (RPS, 2011). Monitoring undertaken as part of the program included surveying of fauna habitat quality, diurnal bird monitoring and monitoring of microbat species across eleven monitoring sites, see **Figure 3.10**, (refer **Appendix K**).

Nine of eleven monitoring sites were surveyed for habitat quality as one of the sites was unable to be assessed due to access constraints. Monitoring of microbat species was also undertaken for ten of the eleven recommended sites. All ten recommended sites were able to be monitored for diurnal birds during the reporting period; however the site associated with access constraints (BM1) was predominantly reliant upon call identification.

#### Control Strategy

A variety of control strategies have been implemented at the Bulga Coal Complex to mitigate and manage potential impacts upon flora and fauna as a result of mining activities during the reporting period. The following management and control strategies have been implemented at the Bulga Coal Complex during the reporting period to manage potentially negative impacts upon flora and fauna wherever possible:

- Minimise clearing of vegetation;
- Manage surface water so that adjoining vegetation communities and aquatic systems are not disturbed;

**Figure 3.10**

**BULGA COAL COMPLEX ECOLOGICAL MONITORING SITES**

**MINING LEASES**

▲ Ecological Monitoring

**Rehabilitation Monitoring**

▲ Pasture Reference

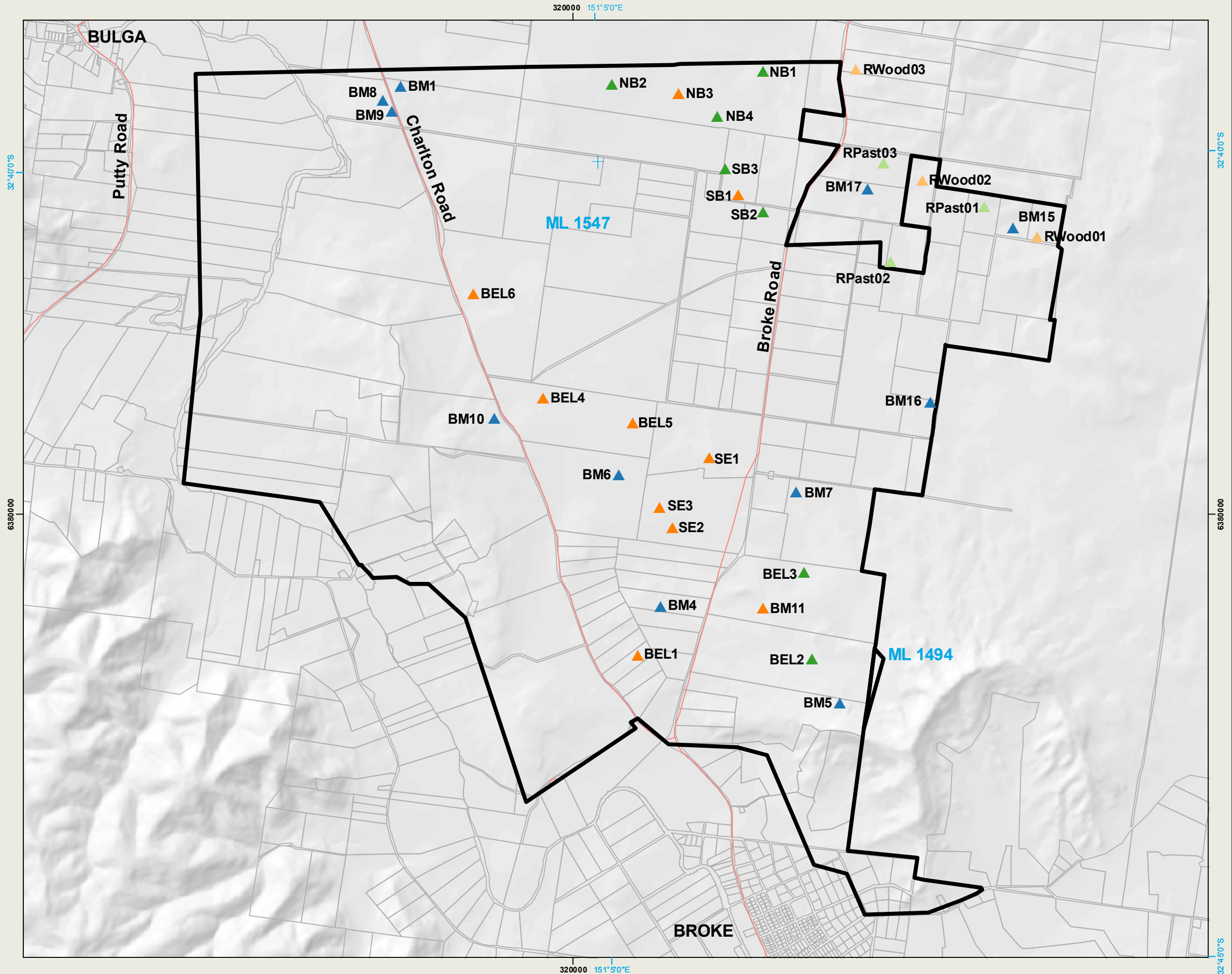
▲ Pasture Rehabilitation

▲ Woodland Reference

▲ Woodland Rehabilitation

— Road

□ Cadastre

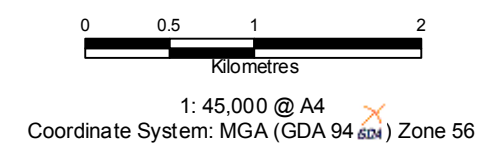


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32°40'0"S  
32°45'0"S

- Manage erosion and sedimentation so that adjoining vegetation communities and aquatic systems are not disturbed;
- Manage noise and dust to minimise impacts to adjoining vegetation communities, fauna and habitats as described in the Bulga Coal Noise Management Plan and Dust Management Plan;
- Control exotic plants and animals as described in the Bulga Coal Landscape and Revegetation Management Plan;
- Identification of likely habitat trees in woodland stands; and
- Heavy machinery is excluded from all areas of vegetation that are not proposed for clearing.

### Variations from Control Strategy/s

There were no variations from control strategies and management measures outlined within the approved Flora and Fauna Management Plan during the reporting period, although variations were made to the annual ecological monitoring program and the rehabilitation monitoring program. These variations have been included in a revised Flora and Fauna Management Plan (in draft). The revised Flora and Fauna Management Plan will be submitted to the NSW Department of Planning in 2011 and will be subsequently made available on the Bulga Coal Complex website following its approval.

### 3.10.2 Environmental Performance

#### Results

##### Flora

Native species remained the dominant ground cover component although; exotic species were present at all sites. Most sites were floristically rich, with up to 70 species being recorded in the two new riparian sites, BM15 and BM17. BM10, a grassy *E. moluccana* woodland, contained 69 species in the 50x20m monitoring quadrat. There was good total ground cover in all but site BM15, but there were numerous bare macropod tracks that may have reduced total ground cover and are commonly points of potential erosion or leakage from these systems. Most of the floristic diversity comprising these sites were various species of herbs and grasses, but in some sites shrub diversity was also high (BM4 and BM5).

No species listed in the Threatened Species Conservation Act (TSCA) or Environmental Protection and Biodiversity Act (EPBC) were recorded but in sites in BM8 and BM9, there was an abundance of *Grevillea Montana*, a 2VC ROTAP (PlantNet 2010). *Cymbopogon obtectus* (BM9, BM10 and BM15), *Enchylaena tomentosa* (BM15 and BM16) and *Linum marginale* (BM15) are species recognised as uncommon in the area (Peake 2006).

*Senecio madagascariensis* (Fireweed), an introduced annual was present in all sites. Noxious species included *Lantana camara* (Lantana) and *Lycium ferocissimum* (African Boxthorn) however *Opuntia stricta* (Common prickly Pear) was the most abundant noxious species, being found in seven sites.

##### Fauna

The Annual Ecological Monitoring Report (RPS, 2011) detailed monitoring undertaken for the reporting period. This monitoring was completed in order to assess diurnal birds, microbat species and the health of fauna habitat at the Bulga Coal Complex. Observed monitoring results for the reporting period as detailed within the Annual Ecological Monitoring Report have been detailed below.

A total of 42 bird species were systematically recorded during the survey periods. These included, but were not limited to Ducks, birds of prey, Parrots, Kingfishers, Fairy-wrens, Thornbills, Pardalote, Honeyeaters, Babblers, Thrushes and Butcherbirds. No introduced species of birds were detected during monitoring at the Bulga Coal Complex.

Three threatened bird species were recorded out of the 42 bird species detected. These species included the Little Lorikeet (*Glossopsitta pusilla*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*) and Speckled Warbler (*Pyrrholaemus saggitatus*). All three of these species are listed as Vulnerable under the Threatened Species Conservation Act 1995 (TSC Act 1995). In previous reporting periods a total of five threatened bird species have been detected during annual ecological monitoring at the Bulga Coal Complex. These species differ from those observed by RPS in the Annual Ecological Monitoring Report and include the Brown Treecreeper (*Climacteris picumnus victoriae*), Diamond Firetail (*Stagonopleura guttata*), Little Eagle (*Hieraaetus morphnoides*), Hooded Robin (*Melanodryas cucullata cucullata*) and the Varied Sittella (*Daphoenositta chrysoptera*).

Whilst these additional five threatened species were not detected during the annual monitoring event, it is not definitive that the species no longer utilise the site. A large amount of suitable habitat within and outside the Bulga Coal Complex was identified during the survey of fauna habitat health and in light of this information it is likely that these species may only utilise the site intermediately (RPS, 2011).

The presence of the Little Lorikeet, Grey-crowned Babbler and Speckled Warbler as well as the absence of introduced diurnal bird species indicates that the site is associated with habitat of relatively high quality and low levels of disturbance. Due to the sedentary nature of the Grey-crowned Babbler and the Speckled Warbler, it is likely that the sites were able to provide the essential habitat elements required for these species to feed and breed successfully (RPS, 2011).

A total of thirteen species of microbats were recorded during the survey periods. Of the thirteen identified species there were three threatened species listed as Vulnerable under the TSC Act 1995. These species include the Large-eared Pied Bat (*Chalinolobus dwyeri*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) and the Yellow – bellied Sheathtail Bat (*Saccolaimus flaviventris*). The Large-eared Pied Bat is also listed as Vulnerable under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999). Eastern False Pipistrelle and Yellow-bellied Sheathtail Bat had not previously been recorded during annual monitoring events at the Bulga Coal Complex (RPS, 2011).

All three threatened bat species are sensitive to the loss of forests and woodlands which provide foraging habitats, and in the case of the Eastern False Pipistrelle and Yellow-bellied Sheathtail Bat, tree hollows for roosting. Further to this, the detection of thirteen bat species during the monitoring event indicates that insect foraging opportunities are of a sufficient level to provide habitat requirements for a variety of microbat species (RPS, 2011).

## Performance Outcomes

The management measures and monitoring system implemented at the Bulga Coal Complex during the 2010 has effectively prevented any flora and fauna related incidents during the reporting period.

### 3.10.3 Incidents and Improvements

All activities relating to the management of flora and fauna species undertaken during the reporting period were done so in accordance with the approved Flora and Fauna Management Plan.

The following recommendations have been provided by DnA Environmental and RPS at the conclusion of respective monitoring programs.

#### Annual Rehabilitation Monitoring Program

DnA Environmental recommended that the following measures be implemented at the Bulga Coal Complex to order to improve the management of flora throughout the site:

- Update of the Bulga Coal Complex Flora and Fauna Management Plan, incorporating the revised rehabilitation and post mining land use strategies documented in the draft Landscape Management Plan (following DoP approval);

- Improvements to the weed and invertebrate pest monitoring and control program across the Bulga Coal Complex;
- Consider opportunities to thin areas of dense regrowth, particularly BM5;
- Implement a 'critical habitat' improvement program across the Bulga Coal Complex targeting known threatened species;
- Consider implementing a sustainable nutrient recycling improvement program for remnant vegetation; and
- Develop and implement a riparian / drainage line rehabilitation program for both Nine Mile and Loaders creek catchments.

### **Annual Ecological Monitoring Program**

The Annual Ecological Monitoring Report (RPS, 2011) provided the following recommendations to improve ecological function at monitoring sites located throughout the Bulga Coal Complex:

- The variety of native understorey plants (shrubs and grasses) could be improved at a variety of monitoring sites through the planting of endemic native species. This could result in increasing habitat complexity and decreasing exposed or eroded land throughout the sites;
- The use of nest boxes could be used to enhance the habitat potential of trees throughout various monitoring sites at the Bulga Coal Complex;
- Planting of trees and other understorey species in selected sites as outlined within the Annual Ecological Monitoring Report to reduce the distance between similar vegetation or scattered trees to less than 100m;
- Reduce weed infestation levels through the implementation of a weed control program;
- Ensure that all domestic animals (e.g. cattle) are prevented from accessing areas that wish to be improved. This may involve the installation and/or maintenance of fencing;
- Develop and implement a comprehensive fire management plan; and
- Continue monitoring the sites following the methodology described within the Annual Ecological Monitoring Report (RPS, 2011) and compliment the data sets through the introduction of other monitoring methods and sites.

## **3.11 Weed and Pest Management**

### **3.11.1 Environmental Management**

#### **Monitoring System / Control Strategy**

A Weed and Pest Management Plan is not required by the Underground or Surface Operations development consents but one has been developed. The Bulga Coal Complex Weed and Pest Management Plan was implemented during the reporting period.

The Weed and Pest Management Plan provides:

- A baseline survey of the Bulga Coal Complex;
- A review of management and control options;
- An assessment to identify priority control areas;
- An outline of monitoring needs, methods and reporting; and
- An annual work schedule for ongoing weed and pest management.

The Underground Operations completed targeted weed control works in October and November 2010. The program included a combination of spot spraying and boom spraying targeting galenia, thistle and blackberry across the remnant South Bulga, Blakefield South and Beltana Mining areas. Some areas identified in the 2010 weed control program could not be completed due to adverse weather conditions, though the remaining work is expected to be undertaken in early 2011.

Weed control at the Surface Operations focused on three areas north and east of the Mine Infrastructure Area, covering an area of approximately 50 Ha. Weed spraying and physical removal targeted the following species:

- Prickly Pear; and
- Saffron Thistle.

### **Variations from Control Strategy/s**

The following variations from the abovementioned control strategy have been implemented at the Bulga Coal Complex during the reporting period:

- Minimise vegetation disturbance within conservation areas by reducing the number of tracks and/or consistently accessing these areas via the same route;
- Early establishment and maintenance of fast growing native grasses, shrubs and trees particularly during rehabilitation; and
- Regular weed removal of topsoil stockpiles, avoiding the risk of weed dispersal into surrounding bushland.

### **3.11.2 Environmental Performance**

#### **Results**

There is currently no requirement under existing development consents for monitoring data pertaining to weed and pest management to be recorded at the Bulga Coal Complex. Management measures as outlined within the Weed and Pest Management Plan will continue to be implemented to effectively manage potential associated impacts.

#### **Performance Outcomes**

Implementation of management measures and the monitoring strategy at the Bulga Coal Complex have resulted in no weed/pest related incidents or complaints.

### **3.11.3 Incidents and Improvements**

No incidents relating to weeds and pests have been recorded at the Bulga Coal Complex during the 2010 reporting period. Improvements in the form of the abovementioned variations for the existing control strategy will be implemented at the complex during the 2011 reporting period.

## **3.12 Archaeology and Heritage**

### **3.12.1 Environmental Management**

#### **Monitoring System / Control Strategy**

Projects undertaken with the potential to affect archaeology and heritage at the Bulga Coal Complex are undertaken in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP). The ACHMP was reviewed in 2010 to develop a management plan that covers the whole Bulga Coal Complex, both surface and underground operations. This included the development of a Geographical Information System

(GIS) database for all known sites and previously studied areas. This revised ACHMP will be supplied to the relevant stakeholders for comment and consultation in 2011, prior to submitting to the DoP for approval.

Two relevant projects were undertaken during the reporting period. These have been described below:

### Underground Operations

The Underground Operations completed an application for an Aboriginal Heritage Impact Permit (AHIP), in consultation with relevant Registered Aboriginal Parties. This AHIP was completed for sites that may be impacted by subsidence associated with Blakefield South Longwalls 1 – 6. Registered Aboriginal Parties that were consulted during the completion of this AHIP were:

- Aboriginal Native Title Consultants;
- Bullen Bullen Heritage Consultants;
- Cacatua Culture Consultants;
- Carrawonga Consultants;
- Culturally Aware;
- Gidawaa Walang Cultural Heritage Consultancy;
- Giwiirr Consultants;
- Hunter Valley Cultural Consultants;
- Mingga Consultants;
- Ungooroo Aboriginal Corporation;
- Ungooroo Cultural & Community Services;
- Upper Hunter Heritage Consultants
- Wattaka Wonnarua CC Services;
- Wonn1 Contracting;
- Wanaruah Local Aboriginal Land Council;
- Yarrawalk;
- Yinarr Cultural Services;
- Kayaway Eco-Cultural and Heritage Services;
- Wonnarua Culture Heritage;
- Hunter Valley Cultural Surveying;
- Wonnarua Custodians Aboriginal Corporation;
- Wonnarua Nation Aboriginal Corporation;
- Upper Hunter Wonnarua Council;
- Hunter Traditional Owner Environmental Management Services; and
- Hunter Valley Aboriginal Corporation.

AHIP#3301 was issued by DECCW on 14 July 2010. This AHIP takes a staged approach in determining the need for salvage of sites within the Blakefield South Longwall 1 - 6 area. Under AHIP#3301, eleven sites located in the Blakefield South Longwall 1 - 2 area were subject to salvage, see **Figure 3.12**. Monitoring of subsidence impacts within the affected area are used to inform the need for salvage of sites within the Longwall 3 - 6 areas.

In accordance with AHIP#3301 the following sites were subject to salvage in the form of surface collection:

- Saxonvale A (37-6-0139);
- BOC10A1 (37-6-0873);
- BOC1A1/Broke Rd 1 (37-6-0892/37-6-0804);
- BOC2A1 (37-6-0893);
- BOC5a1 Loaders Creek (37-6-0897);
- BCO2 (37-6-1047/37-6-1395);
- BCO3 (37-6-1048) – part only;
- BCO1 (37-6-1394);
- BCO7 (37-6-1398);
- BCO8 (37-6-1399); and
- BCO9 (37-6-1400).

Sub-surface salvage in the form of a two stage excavation process was also conducted within part of BCO1. All salvage works were completed with the assistance of representatives from the Registered Aboriginal Parties on 16 - 20 August and 8 December 2010.

Approximately 545 surface artefacts were collected and 870 artefacts were salvaged via systematic excavation. These artefacts are currently undergoing analysis and a report detailing the results of the

salvage activities in the Blakefield South Longwall 1 - 2 area will be completed in accordance with the conditions of AHIP#3301.

A draft Conservation Agreement and associated documents for the Beltana Conservation Area (off Charlton Road) were reviewed in a previous reporting period. Consultation in relation to the Conservation Area was ongoing in 2010 and will continue in 2011.

Consultation regarding the establishment of a proposed teaching/keeping place was ongoing in 2010 and included 6 committee meetings. Further consultation with the Aboriginal community regarding the teaching/keeping place will continue in 2011.

### **Surface Operations**

The Surface Operations completed an Aboriginal Heritage Impact Assessment (RPS 2010) during the reporting period. This assessment was completed in relation to a proposed rail refuelling facility to be located adjacent to the existing rail loop at the Bulga CHPP. The following Aboriginal stakeholder groups registered an interest in being consulted regarding the Aboriginal Heritage Impact Assessment:

- Ungooroo Aboriginal Corporation;
- Gidawaa Walang Cultural Heritage Consultancy;
- Muronga Gialinga (Mudgee Local Aboriginal Land Council);
- Wanaruah Local Aboriginal Land Council;
- Cacatua Cultural Consultants;
- Muswellbrook Cultural Consultants;
- Yinarr Culture Services;
- Wonn1 Contracting;
- Ellilewis;
- Hunter Valley Aboriginal Corporation;
- Culturally Aware;
- Yarrawalk; and
- Wonnarua Culture Heritage.

A representative from Ungooroo Aboriginal Corporation and from Gidawaa Walang Cultural Heritage Consultancy participated in the survey of the proposed rail refuelling area. The thirteen groups and the Upper Hunter Wonnarua Council were provided with a copy of the draft Aboriginal Heritage Impact Assessment. This draft copy of the assessment was provided so that these Aboriginal groups would have the opportunity to comment on the document and recommendations made within.

The survey of the proposed rail refuelling area was conducted by RPS on 21 October 2010. Two artefact scatters (RPS Bulga AS1 and RPS Bulga AS2) were identified over the course of the survey. RPS Bulga AS1 contained 32 artefacts located on a contour bank associated with the existing rail loop and was highly disturbed. RPS Bulga AS2 contained 10 artefacts on a fire trail and was also highly disturbed.












The sites were assessed as having moderate cultural significance and low archaeological significance (RPS, 2010). The Aboriginal Heritage Impact Assessment recommended that the sites be demarcated and avoided during works in the area or, if either site cannot be avoided or is subject to disturbance through erosion, an Aboriginal Heritage Impact Permit should be obtained and the artefacts should be collected or moved or appropriate erosion control measures undertaken. Neither site will be subject to direct impact from the proposed rail refuelling facility. The facility was relocated to avoid any potential impact.

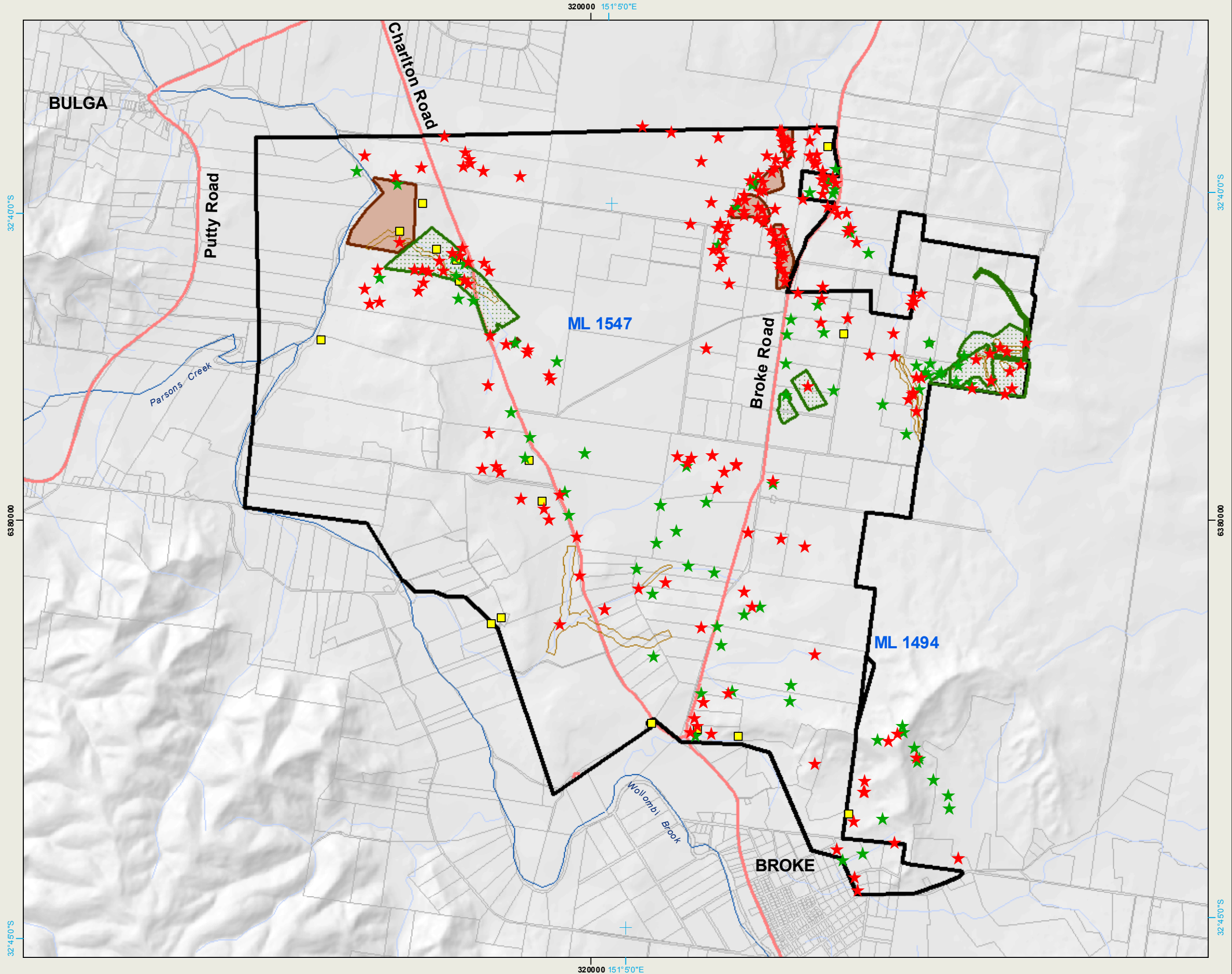
Further works completed by the Surface Operations relevant to archaeology and heritage during the reporting period include the submissions of Aboriginal Site Impact Recording Forms (ASIRF) to DECCW on 17 June 2010. These ASIRFs were completed in accordance with AHIP#3066 and AHIP#3212 and associated salvage works that were conducted in the previous reporting period. These salvage works were associated with the approved construction of the Coal Handling and Preparation Plant dam. A report will be completed in accordance with the relevant AHIP conditions and submitted to DECCW within the next reporting period.

#### **Variations from Control Strategy/s**

All activities/projects relating to archaeology and heritage during the reporting period have been undertaken in accordance with the approved Aboriginal Cultural Heritage Management Plans for the underground (Beltana, 2004) and surface operations (ERM, 2001) at the Bulga Coal Complex.

# Figure 3.12 BULGA COAL COMPLEX CULTURAL HERITAGE SITES

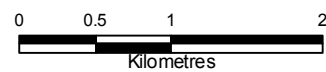
-  MINING LEASES
-  European Heritage Site
-  Artefact Scatter Site
-  AHIP Boundary
-  Isolated Artefact Site
-  Artefact Scatter Area
-  Conservation Area
-  Road
-  Watercourse
-  Minor Watercourse
-  Cadastre



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1: 50,000 @ A4  
Coordinate System: MGA (GDA 94) Zone 56



### 3.12.2 Environmental Performance

#### Results

During the 2010 reporting period all activities relating to the management of archaeological and heritage at the Bulga Coal Complex were effectively undertaken in accordance with the approved Aboriginal Cultural Heritage Management Plans.

#### Performance Outcomes

The effective implementation of the monitoring strategy and management measures have resulted in no archaeological or heritage related incidents, complaints or non compliance at the Bulga Coal Complex during the reporting period.

### 3.12.3 Incidents and Improvements

A detailed Aboriginal Cultural Heritage Management Plan for the Bulga Coal Complex is currently being developed in consultation with Aboriginal stakeholders. This document will replace the existing approved Aboriginal Cultural Heritage Management Plans for the underground operations (Beltana 2004) and the surface operations (ERM 2001). It is designed to ensure consistent management of Aboriginal cultural heritage throughout the Bulga Coal Complex and includes a significant geospatial component to assist in operational decision-making.

## 3.13 Visual and Light

### 3.13.1 Environmental Management

#### Monitoring System

Potential visual and light related impacts associated with the Bulga Coal Complex are assessed through a variety of monitoring and inspection regimes. Monitoring has been undertaken by specialist consultants (Webb Australia Group Pty. Ltd.) and has included monitoring of site wide lighting impacts and compliance with development consent conditions. Monitoring included the angle at which light is emitted from lamps and luminaries; glare; spill and sky glow.

Regular reviews of the mine plan are undertaken by mining engineers and mine supervisors to minimise the amount of light which can potentially be seen from non-project related residences. Inspections are also undertaken to identify the quality of rehabilitated land, the effectiveness of visual bunds and lighting shields.

#### Control Strategy

A diverse selection of control strategies have been utilised at the Bulga Coal Complex to minimise potential visual and light related impacts associated with mining operations and to ensure that no external lights shine above the horizon. Strategies for the reporting period include:

- Upgrading lighting of surface infrastructure in accordance with AS2482 – 1997, 'Control of the Obtrusive Affects of Outdoor Lighting';
- Lighting is located and orientated in a manner which minimises the potential impact upon surrounding properties;
- Advantage is taken of any existing buffers or screening to minimise the potential for light/visual related impacts;
- Maintenance and installation of visual bunds;
- Installation of colourbond sheds to enclose infrastructure and decrease visual impacts;

- Wire caging or camouflage sheds are used to enclose gas drainage wells that are located at a significant distance from public view points;
- Photo decals or green colourbond sheds are used in areas of close proximity to public view points;
- Hand painted colourbond sheds are also used in areas within close proximity to public view points;
- Wherever possible infrastructure surfaces are painted with a colour that blends in with the natural landscape or is low or non-reflective;
- Regular review of the mine plan to minimise the amount of light potentially visible off-site;
- Installation of lighting shields within the Surface Operations area to direct light from the dragline upper boom to the area of interest;
- Maintenance of light fitting louvers to shield sensitive receivers from stray light and to focus light on work areas;
- Lights are switched off when not deemed required for safety or security requirements. Wherever possible sensor lights are used to reduce the time that lights are on;
- Maintenance of lighting throughout the complex including light direction;
- Use of lower wattage bulbs where possible;
- Monitoring of rehabilitation;
- Inspections of landscaped areas and visual screens;
- Night time inspections undertaken to assess illumination of the night sky; and
- Visibility inspections undertaken.

#### **Variations from Control Strategy/s**

No variations from the control strategies outlined within the XCN Light Management Procedure; XCN Visual Impact Procedure; and the Lighting Audit and Report (Webb Australia Group, 2010) have been undertaken during the reporting period.

### **3.13.2 Environmental Performance**

#### **Results**

No incidents relating to visual and/or light related impacts have been recorded during the reporting period, there were three visual and/or light related complaints. Further details regarding these complaints can be found in **Appendix L**.

#### **Performance Outcomes**

Management measures and control strategies outlined within XCN procedures and the Lighting and Audit Report are being implemented at the Bulga Coal Complex. These strategies and control measures have resulted in no incidents and only one complaint during the reporting period.

### **3.13.3 Incidents and Improvements**

Bulga Coal will progressively upgrade the fixed site lighting to bring all lights into conformance with the relevant Australian Standard.

## 3.14 Spontaneous Combustion

### 3.14.1 Environmental Management

#### Monitoring System

The monitoring of spontaneous combustion is undertaken at the Bulga Coal Complex on a regular basis. This monitoring is focused upon potentially affected areas including coal handling and processing plant (CHPP) and underground operations.

Monitoring of underground operations includes continuous gas monitoring. This is undertaken to monitor Systems for the purpose of monitoring the status of spontaneous combustion and to identify any potential increase in risk. This includes continuous gas monitoring of mine airway and goaf atmospheres, minimum standards for monitoring, and analysis of sample results and trends.

#### Control Strategy

Spontaneous combustion is managed through the implementation of a variety of management measures and mitigation strategies. These measures and strategies are undertaken in accordance with the approved Spontaneous Combustion Management Plan and Mine Operation Plans for respective operations at the complex. Strategies and controls implemented throughout the reporting period include the following:

- Sealing of coal seams in the final highwall and end wall;
- Coal work areas are kept clean and tidy to minimise the accumulation of coal;
- ROM and product stockpiles are minimised in size to reduce residence time and therefore the potential for oxidation;
- Ventilation and mine layout have been optimised to allow the management of any spontaneous combustion events in the underground operations in the event that they occur;
- Awareness of spontaneous combustion on site and training of personnel to identify and report spontaneous combustion;
- Minimum standards for mine planning and design, which includes design for pillar stability and strata control, and mine geometry to exclude bleeder airways;
- Ventilation management. This includes minimum standards for ventilation change, control and appliance management, minimising pressure differentials and leakage, and balancing pressure differentials across longwall goafs;
- Systems for the purpose of monitoring the status of spontaneous combustion and to identify any potential increase in risk. This includes continuous gas monitoring of both mine airway and goaf atmospheres, minimum standards for monitoring, and analysis of sample results and trends;
- Coarse rejects are incorporated into the overburden within the Surface Operations and buried so as to prevent spontaneous combustion;
- Alarm management; and
- Response and recovery.

#### Variations from Control Strategy/s

There were no variations from the control strategies outlined within the approved Spontaneous Combustion Management Plan and respective Mine Operations Plans for the underground and surface operations.

### 3.14.2 Environmental Performance

#### Results

There was a minor recurrence of spontaneous combustion in coal left in the low wall of the Southern Extension Pit. Access to the low wall was re-established and the heating was covered with more overburden which appears to have smothered the spontaneous combustion.

#### Performance Outcomes

Management strategies outlined within the Spontaneous Combustion Management Plan and MOPs have resulted only one incidence of spontaneous combustion being reported at the Bulga Coal Complex. These strategies have been integrated into daily operations at the complex.

### 3.14.3 Incidents and Improvements

There was only one spontaneous combustion occurrence reported at the Bulga Coal Complex during the reporting period. The spontaneous combustion occurrence was controlled and as such the management plan is deemed to be adequate.

## 3.15 Bushfire

### 3.15.1 Environmental Management

#### Monitoring System

Bushfire monitoring activities undertaken during the reporting period have been completed in accordance with the Bulga Complex Bushfire Management Plan. Areas to be monitored for bushfire management at the Bulga Coal Complex have been identified using the methodology to calculate bushfire hazard potential outlined by the Department of Environment and Planning (1981). This methodology maps areas into three bushfire hazard potential units being high, medium and low fire hazard. Hazard potential is calculated by modelling the bushfire factors of fuel production vegetation, slope, fire frequency, existing developments, existing vegetation, accessibility and availability of fire fighting services.

The following monitoring activities were undertaken during the reporting period:

- Monitoring of fuel loads in forested areas that adjoin Charlton and Broke Roads;
- Monitoring of trails in the southeast of the Bulga Coal Complex remain accessible by regularly checking for fallen logs, erosion or other signs of trail degradation;
- Fire weather conditions were monitored daily;
- The maintenance of fire equipment is monitored by the Safety/Training Coordinator; and
- Monitoring of the requirement for hazard reduction measures to be completed, particularly for areas associated with boundaries of adjoining land holdings.

#### Control Strategy

Bushfire management strategies undertaken at the Bulga Coal Complex are done so in accordance with the Bulga Complex Bushfire Management Plan. Control strategies undertaken during the reporting period include the following:

- Mechanical reduction of fuel levels including mowing, slashing, ploughing, flailing and manual removal;
- Maintenance of firebreaks around the coal preparation plant to minimise the risk of a bushfire reaching the coal stockpiles, buildings and stores;

- Adherence to fire bans as determined by the Singleton Rural Fire Service;
- Ignition sources such as welding and cutting are restricted to workshop areas or within active parts of the mine where vegetation is non-existent;
- Maintenance of fire equipment including overhead sprinklers installed at transfer points on conveyors, fire reels, hydrants and extinguishers; and
- Hazard reduction measures were implemented and paid particular attention to the boundaries of adjoining properties.

The Bulga Coal Complex is also host to the following fire equipment and facilities:

- A mine rescue station accommodating a fully equipped and maintained fire engine;
- Three 185,000 litre water carts, available for use as water reservoirs if required. The carts have been fitted with the standardised Rural Fire Service equipment STORZ fittings;
- Helipad and road access points;
- Dams and maintained watering points;
- Emergency phones and fire extinguishers provided at vantage points within the surface facilities;
- Portable radios;
- Earthmoving equipment; and
- Trained personnel with protective clothing.

### **Variations from Control Strategy/s**

There were no variations from the control strategies outlined within the Bulga Coal Complex Bushfire Management Plan during the reporting period.

### **3.15.2 Environmental Performance**

#### **Results**

No bushfire events were recorded at the Bulga Coal Complex during 2010.

#### **Performance Outcomes**

The Bulga Coal Complex continued to maintain existing fire breaks surrounding the CHPP and power line easements during the reporting period. The revised Bushfire Management Plan will be submitted to the DoP in 2011 and will be subsequently made available on the Bulga Coal Complex website following its approval.

#### **Incidents and Improvements**

There were no recorded bushfire incidents at the Bulga Coal Complex during the reporting period. The Bulga Coal Complex Bushfire Management Plan is currently under review. As a result of this, no further requirement for the improvement and/or review of management strategies associated with bushfire was required. All existing fire breaks were maintained during the reporting period.

## 3.16 Methane Drainage and Ventilation

### 3.16.1 Environmental Management

#### Monitoring System

Methane drainage and ventilation is a solely Underground Operations activity. Methane and carbon dioxide are measured in the gas drainage project and in the mine ventilation system. The gas drainage project has monitoring at all gas wells, at the flaring facility, and at the goaf vacuum pumps. The gas composition and flow rate is trended in the site's continuous monitoring system, and long-term data stored offsite in the Environmental Monitoring database.

The ventilation monitoring is performed once a month by the Ventilation Officer and reported to the department of Industry and Investment. Long-term records are also stored in the Environmental Monitoring database.

#### Control Strategy

The Bulga Underground Operations actively manage methane drainage through the implementation of the coal seam gas drainage project in the Blakefield South mining activities. The project aims to pre-drain and post-drain the coal seams to provide a safer more efficient work environment. The drained methane is flared to lower greenhouse gas emissions resulting from the project.

Pre-mining gas drainage infrastructure is constructed to extract gas from the target seam prior to commencing underground workings, helping to create a safer work place. Coal seam water is also extracted from these gas drainage boreholes in preparation for underground mining.

Post-mining (goaf) gas drainage wells are also constructed to remove gas that will interfere with the retreating longwall face. The goaf wells are drilled and installed prior to mining, however gas extraction does not occur until the methane becomes mobilised in the goaf. The Bulga Underground Operations constructed 34 goaf wells during 2010, over longwalls Blakefield South Longwalls 1 and 2. The locations of wells drilled for gas drainage during 2010 are shown in **Figure 2.1**.

A Goaf suction plant, illustrated in **Plate 2.2** was constructed during 2010 and was operational by October 2010. Two of the four pumps of the facility are currently operating, with the intention to increase to full vacuum pumping in 2011. Underground in-seam gas drainage also took place during 2010. This involved the drilling of horizontal holes from the underground directly into the Blakefield seam to accelerate the extraction of methane in areas where the surface pre-mining drainage had not reduced the coal gas content to an acceptable level for development mining. The gas extracted by this process was drawn out by the surface gas wells.

### 3.16.2 Environmental Performance

#### Results

A summary of ventilation data recorded during the reporting period has been provided in **Table 3.12**. This monitoring data is associated with current Underground Operations at the Bulga Coal Complex which consists of Beltana, South Bulga and Blakefield South.

**Table 3.12 Summary of Ventilation; Annual Averages for 2010**

Ventilation shaft	Methane (%)	CO2 (%)	Flow (m <sup>3</sup> /sec)
Beltana	0.26	0.05	104.55
South Bulga	0.00	0.04	32.31
Blakefield South	0.43	0.04	392.54

For further details regarding ventilation shaft monitoring refer to **Appendix M**.

A condition of the Underground Operation's development consent is that ventilation shaft monitoring be carried out within three months of commissioning a new shaft and to submit the results to the DECCW. The second of the ventilation shafts at Blakefield South was commissioned in 2010. A further requirement of the consent is that a comparison be made between the sampling undertaken and the odour and dust ranges used in the dispersion modelling study in the Statement of Environmental Effects for the Bulga Underground - Southern Mining Area Modification - Section 96(2) Application to Modify Consent DA 376-8-2003. The results were as follows:

#### *Dust Impacts*

The estimated TSP dust emission from underground ventilation air used in the 2007 SEE for vent shaft 2 was 18,291kg/yr. The mass emission rate measured from the Blakefield South Ventilation Shaft 2 equates to 4,860kg/yr.

#### *Odour*

For air quality assessment purposes in the 2007 SEE an odour level of 170 OU was assumed for the underground ventilation air. When an odour level of 170 OU was used in the AUSPLUME dispersion model it was found that no residence was predicted to exceed the EPA assessment criterion of 7 OU. The odour level measured from the Blakefield South Ventilation Shaft 2 was 43 OU.

Therefore, the independent sampling of the Blakefield South Ventilation Shaft 1 was found to be compliant against both Condition 4.27 and Condition 4.28 of Underground Operation's development consent.

### **Performance Outcomes**

The flares have been successful in reducing the greenhouse gas emissions from the mine by the conversion of methane to carbon dioxide. This is discussed further in **Section 3.19**.

### **3.16.3 Incidents and Improvements**

There were no incidents in the gas drainage project during the year. Extra flares to manage the gas being drawn from the goaf gas wells are planned to be constructed in 2011-2012.

## **3.17 Hydrocarbon Contamination**

### **3.17.1 Environmental Management**

#### **Monitoring System**

In December 2009 Bulga Coal, in accordance with condition 8.4(a) of Development Consent DA 41-03-99, commissioned Parsons Brinkerhoff (PB) to complete its 3 yearly Independent Environmental Audit. Observations and subsequent recommendations made during and following this audit included improvements to hydrocarbon management. Based on this observation the following recommendations were made;

- R1:** It is recommended that a formal review of compliance be undertaken against AS1940 - 1993, the use of self bunded tanks be considered and the installation, operation and maintenance of oily-water separators be substantially improved; and

- R2:** DECC should be notified of the potential or Actual Environmental Harm in accordance with condition R2 of EPL 563 and all land and water contamination be remediated. A review of all hydrocarbon management practises should be undertaken and changes implemented to bring the site in line with accepted practice.

Following the completion of this audit, a Phase 2 Environmental Assessment (December 2009) was undertaken by an external consultant (PB). The assessment led to reporting the Bulga Area Station as a contaminated site in accordance with Schedule 2 of the Contaminated Land Management Act 1997. The requirement to report under schedule was triggered by changes to the CLM Act which was enacted in December 2009.

Bulga subsequently reported (February 2010) to the Department of Environment, Climate Change and Water (DECCW) under s147 of the Protection of the Environment Operations Act 1997. In response to this report, DECCW acknowledged the receipt of the report and requested that groundwater investigations be included in contamination assessments and that the Phase 2 Environmental Assessment be provided to DECCW once complete. The Phase 2 Environmental Assessment was provided to DECCW following its completion and as at February 2011, no further correspondence has been received.

In February 2010 Bulga Coal further commissioned PB to prepare a Remedial Action Plan (Phase 3) to document a remediation strategy for the fuel storage, refuelling and maintenance areas of the Bulga Mine. The purpose of the Bulga RAP is to address remediation required to address identified environmental risks and provide a framework for remediation and contingencies required during site infrastructure upgrades and during facility and mine closure.

During the reporting period, site specific improvement projects were completed in accordance with the project execution plan, including upgrade of oily water separators and commencement of upgrade to site hydrocarbon storage facilities.

In August 2010 an audit of hydrocarbon storage against AS1940 – 1993 was conducted at the Underground Operations. Each site (Beltana and Blakefield South) was found to be generally fit for purpose; however there were some areas of non-compliance ranging from general housekeeping and documentation/signage to equipment changes and control equipment. Items requiring attention and the changes implemented will be reported in the 2011 AEMR.

### **Control Strategy**

Control strategies implemented to manage hydrocarbon related impacts at the Bulga Coal Complex have been undertaken in accordance with the following Management Plans:

- Hydrocarbon Management Plan;
- Bulga Coal Surface Operations Remedial Action Plan;
- Bulga Coal Surface Operations Bioremediation Management Plan; and
- Bulga Coal Complex Spill Response Procedures.

Control strategies implemented in accordance with the abovementioned Management Plans include the following:

- Waste activities must be licensed, subject to exemptions;
- A licensed transporter must be used for liquid and non-liquid waste in loads greater than 200kg quantity; and
- Waste tracking is required, subject to exemptions.

All facilities utilised for the storage of hydrocarbons at the Bulga Coal Complex have been designed generally in accordance with AS1940 - 1993. The storage system includes computerised controls for the purpose of monitoring and identification of faults, and includes the following design elements:

- Impervious walls and floors;
- Sufficient capacity to maintain 110% of the volume of the tank (or 110% volume of the largest tank where more than one tank is stored in the bund);
- Have walls not less than 250 millimetres high; and
- Have floors graded to a collection sump.

### **Variations from Control Strategy/s**

There were no variations from control strategies and management measures outlined within the documents detailed above; however an action detailed within the Remedial Action Plan to review the Hydrocarbon Management Plan and associated procedures has not been completed. This action was commenced with a revised Hydrocarbon Management Plan drafted. This Management Plan and associated procedures will be finalised and internally approved (Plan is not required in Development Consent) in 2011.

### **3.17.2 Environmental Performance**

#### **Results**

Following the completion of the Phase 2 Environmental Assessment Bulga Coal Surface Operations have continued both surface and groundwater monitoring programs. No impacts have been identified through execution of this monitoring.

In conjunction with the revision of the Hydrocarbon Management Plan the monitoring program will also be reviewed. This program will be detailed in the 2011 AEMR.

#### **Performance Outcomes**

An external hydrocarbon audit was undertaken by MCE on 16 July 2010. The report found that the site was generally compliant with AS1940 - 1993. However, there were some areas of minor non-compliance which ranged from general housekeeping and documentation/signage to equipment changes and control equipment. The recommendations from the report have been prioritised and allocated, and are to be completed with other upgrades throughout 2011.

As detailed above, no impacts have been identified through execution of the Hydrocarbon monitoring program.

### **3.17.3 Incidents and Improvements**

There were two recorded incidents of hydrocarbon spillages that occurred at the Underground Operations. The first incident resulted in the spillage of 200L of diesel and 60L of hydraulic oil while the second incident caused 10L of oil to be spilt. Both incidents were promptly contained with absorbent, resulting in reversible minor environmental damage.

There were fourteen recorded incidents of hydrocarbon spillages that occurred at the Surface Operations. These incidents were managed in accordance with the Bulga Coal Complex Spill Response and Management Procedure.

All spills that occurred within the Bulga Coal Complex were contained and contaminated materials taken to the Bioremediation Pad for treatment.

A variety of improvements relating to the management of hydrocarbons at the Bulga Coal Complex will be undertaken during the 2011 reporting period. Recommendations as outlined in the external hydrocarbon audit undertaken by MCE have been prioritised and allocated, and are to be completed with other upgrades throughout 2011. Improvements and upgrades to site infrastructure and management of hydrocarbons at the Surface Operations will be completed in accordance with the Bulga Coal Surface Operations Remedial Action Plan.

### **3.18 Public Safety**

#### **3.18.1 Environmental Management**

##### **Monitoring System**

Monitoring relating to public safety at the Bulga Coal Complex is undertaken through the use of a variety of technologies. All site visitors are directed to the main office and are required to report and log on to an electronic visitors book (Onsite Track Easy). Each visitor is required to provide details including their name, company, name of staff members they are visiting, phone numbers and their arrival time. Visitors are also required to logout using the same system when they are leaving site. Visitors are issued with a sticker and pass number that must be possessed at all times whilst on site and return when departing site. The Onsite Track Easy system allows Bulga Coal Complex to effectively monitor the number of people visiting the complex, make contact with these people if necessary and also maintain records of visit duration.

CCTV footage is also recorded at various areas throughout the complex and is able to effectively monitor access of employees/contractors, deter unauthorised access and for security at the complex.

##### **Control Strategy**

The Bulga Coal Complex implements a variety of control strategies to minimise the potential for public safety incidents at the site. These include the implementation of the following:

- Implementation of a security system to ensure public and employee safety is maintained during all aspects of the operation. These systems and procedures have been established in accordance with the relevant requirements under the *Coal Mines Regulation Act 1982*, *Occupation Health and Safety Act 1983*, *Mining Act 1992* and conditions stipulated in the Coal and Mining Leases;
- During hazardous activities such as blasting, sentries are posted throughout the site to prevent unauthorised entry into the blasting zone;
- Use of the Onsite Track Easy, electronic visitors book;
- Security fencing surround the entire perimeter of the complex;
- Security patrols; and
- Employee and contractor inductions regarding mine safety and environmental management issues prior to commencement of work at the site.

##### **Variations from Control Strategy/s**

No variations of the control strategies outlined in Xstrata Coal procedures, Mine Operation Plans (MOPs) or management plans have been undertaken during the reporting period.

#### **3.18.2 Environmental Performance**

##### **Performance Outcomes**

During the reporting period, all abovementioned management strategies pertaining to public safety were effectively implemented at the Bulga Coal Complex.

## Results

There were no public safety incidents recorded at the Bulga Coal Complex for the reporting period. Management measures and control strategies implemented at the complex have been effective in the prevention of incidents regarding public safety during the reporting period.

### 3.18.3 Incidents and Improvements

No incidents have been recorded during the reporting period in relation to public safety; as such there has been no further requirement for the improvement/review of associated management strategies at the Bulga Coal Complex.

## 3.19 Greenhouse Gas Emissions

### 3.19.1 Environmental Management

#### Monitoring System

The Surface and Underground Operations record Greenhouse Gas (GHG) emissions by utilising industry standard factors for diesel usage, explosives and fugitive emissions from stockpiles.

The Underground Operations directly measure greenhouse gas emissions from both ventilation and pre-mining gas drainage. The ventilation system comprises two fans at the Beltana No.1 Mine and two at the Blakefield South Mine. The fans pump surface air into the workings then return the air to the surface. The air extracted by the ventilation shafts is a mix of both atmospheric air and gases released from the underground exposed coal. Both carbon dioxide and methane are measured in the ventilation air.

The gas drawn from the pre-mining wells (discussed in **Section 3.16**) is nearly pure methane, with an average gas content between 96% to 99% CH<sub>4</sub>. At present, this methane is piped to the flaring facility for combustion. The expansion of the flaring facilities completed during 2009 allowed the entire draw from the pre-mining gas wells to be combusted and emitted as carbon dioxide.

#### Control Strategy

Approval for the 25 MW gas fired power generation and VAM abatement unit has been granted and construction commenced in 2010. This project has the potential to reduce the Bulga Underground Operations greenhouse gas emissions by approximately 12%.

#### Variations from Control Strategy/s

There were no variations from existing greenhouse gas management strategies implemented at the Bulga Coal Complex during the reporting period.

### 3.19.2 Environmental Performance

#### Results

GHG emissions for the Bulga Coal Complex during the reporting period are summarised in **Table 3.13**. The emissions in this table have been estimated using the methods specified in DEWHA's *National Greenhouse and Energy Reporting (Measurement) Determination 2008* and DEWHA's *AGO Factors and Methods Workbook 2006*.

**Table 3.13 Bulga Coal Complex Greenhouse Gas Emissions for 2010**

Emission source	Surface Operations (t)	Underground Operations (t)
CO <sub>2</sub> from diesel usage	163,017.9	6,226
CO <sub>2</sub> from explosives	4,757.2	0.05
CO <sub>2</sub> eq from ventilation air <sup>1</sup>	Na	964,182
CO <sub>2</sub> eq from post drainage <sup>2</sup>	Na	14,150
CO <sub>2</sub> eq from pre drainage <sup>3</sup>	Na	143,638
CO <sub>2</sub> from flares	Na	100,040

<sup>1</sup>This includes the CO<sub>2</sub> from the ventilation air plus the CO<sub>2</sub> equivalent of the methane released in the ventilation air.

<sup>2</sup>This includes the CO<sub>2</sub> from the goaf wells plus the CO<sub>2</sub> equivalent of the methane released from the goaf wells.

<sup>3</sup>This includes the CO<sub>2</sub> from the gas drainage plus the CO<sub>2</sub> equivalent of the methane released in the gas drainage (that is not flared).

### Performance Outcomes

The implementation of current greenhouse gas management measures have resulted in the effective management of associated emissions for the Bulga Coal Complex during the reporting period.

#### 3.19.3 Incidents and Improvements

There were no incidents or complaints associated with greenhouse gas emissions at the Bulga Coal Complex during the reporting period. Construction 9 MW of the approved 25 MW gas fired power generation and VAM abatement will commence in 2011 and will potentially reduce the Bulga Underground Operations greenhouse gas emissions by approximately 12%. There has been no further requirement for improvement of greenhouse gas management measures identified throughout the reporting period.

## 4.0 COMMUNITY RELATIONS

The Bulga Coal Complex undertakes a variety of consultation activities on an annual basis. This stakeholder consultation enables those who are potentially affected by operations at the complex to be well informed of activities being undertaken and also being planned for the future. Stakeholder consultation undertaken by the Bulga Coal Complex also allows for the participation of community members and the public in workshops and decision making processes.

### 4.1 Environmental Complaints

During the reporting period a total of thirty environmental complaints were recorded at the Bulga Coal Complex. The clear majority of these complaints were received in relation to the Surface Operations, which is not unexpected as these complaints related to noise, dust, and blast vibration/overpressure. Noise was the most commonly occurring issue of complaint, with a total of twenty complaints registered during the reporting period.

**Table 4.1** below shows a comparison of the reporting period against previous years. Blasting vibration/overpressure has been a consistent complaint issue over the last five years. The key issue in 2010 of noise was also the key issue in 2009, however in the years prior this was not such an emphasized issue. Additionally, an increase in the variety of complaints over the years may reflect changes in the mine operations.

**Table 4.1 Summary of Complaints 2005 - 2010**

	2005	2006	2007	2008	2009	2010	Total
Blast vibration/ overpressure	5	7	1	4	8	7	32
Lighting	1	4	1	0	0	0	6
Dust	0	1	1	1	0	2	5
Noise	0	1	1	4	31	22	59
Subsidence	0	0	3	0	0	0	3
Traffic	0	0	0	5	0	2	7
Visual Amenity	0	0	0	0	0	1	1
Odour	0	0	0	0	0	1	1
Other	0	0	0	0	0	1	1
<b>Total</b>	<b>6</b>	<b>13</b>	<b>7</b>	<b>14</b>	<b>39</b>	<b>36</b>	<b>115</b>

**Table 4.2** below shows the total number stakeholder complaints lodged over the last five years and includes the quantity of complaints associated with each stakeholder. There has been a total of 32 stakeholders lodge complaint/s over the past five years, with 10 in 2010. There were five new stakeholders in 2010 and the highest number of individual stakeholders of the recorded years.

Half of all complaints received by both the Surface and Underground Operations were made by two stakeholders.

An analysis of **Table 4.1** and **4.2** has revealed that blasting is the subject of many unique (one-off) complaints, whereas noise is the predominant issue of repeated complaints.

Table 4.2 Summary of Complaints 2005 - 2010

ID	Complaints	Key Issue
S1	2	Blast vibration/ overpressure
S2	15	Noise
S3	2	Blast vibration/ overpressure
S4	3	Blast vibration/ overpressure
S5	31	Noise
S6	3	Lighting
S7	1	Blast vibration/ overpressure
S8	3	Blast vibration/ overpressure
S9	1	Blast vibration/ overpressure
S10	1	Blast vibration/ overpressure
S11	1	Dust
S12	1	Subsidence
S13	8	Noise
S14	1	Blast vibration/ overpressure
S15	1	Noise
S16	1	Dust
S17	3	Noise
S18	2	Blast vibration/ overpressure
S19	1	Blast vibration/ overpressure
S20	2	Blast vibration/ overpressure
S21	5	Traffic
S22	1	Blast vibration/ overpressure
S23	1	Blast vibration/ overpressure
S24	1	Blast vibration/ overpressure
S25	5	Noise
S26	3	Noise
S27	1	Blast vibration/ overpressure
S28	1	Blast vibration/ overpressure
S29	3	Noise
S30	1	Traffic
S31	1	Noise
S32	1	Dust

A temporal analysis has shown consistent complaints throughout the year with spikes around March and September. It is possible that complaints are associated with noise breaches or temperature inversions. The reporting period of 2010 was a divergence from this trend with complaints being end of year heavy, particularly in October, and this too is expected to reflect such factors.

In response to these complaints a variety of actions were undertaken, included the following:

- Both written and verbal consultation; and
- Offers for stakeholders to accompany staff to real time noise monitors.

Further investigation relating to the mitigation of noise impacts associated with the Surface Operations was undertaken during the reporting period. These mitigation measures were outlined within **Section 3.3**.

A complaint registry which details complaint issues and response is included in **Appendix L**.

## 4.2 Community Liaison

From enjoying dinner at a community barbeque with our neighbours, providing swimming lessons and water survival techniques for school kids to capturing stories of local families about the history of Broke, the Bulga Complex played a proactive role supporting and engaging the community throughout 2010.

We value our relationship with the community and make a concerted effort to maintain these relationships. We do this by being open and honest about our activities; responding to community concerns in a timely and professional manner; maintaining dialogue with the community and supporting community events and activities.

The Bulga Complex maintains a dialogue with the local community through the following initiatives (Note: this is not an exhaustive list of programs/events).

### **Community Barbeque Program**

The Bulga Complex hosted two community barbeques in 2010. Sixty three local residents attended the first barbeque held in June at Margan Restaurant. The attendees included our northern and southern neighbours, CCC members and interested local residents. The evening included dinner and a presentation about our mining activities. Staff from the surface and underground operations were available throughout the night so that residents could discuss any issues or request further consultation if required. The aim of the community barbeque program is to strengthen our relationships with community members,

A second community barbeque was held in Broke in December at the Broke Hall. The barbeque and information display was open to all residents with an invitation letterboxed to residents in Broke and Bulga, along with an advertisement in the Cockfighter newsletter. Thirty five residents attended the event, where staff were on hand to answer any questions about the mine's activities and provide further consultation if required.

### **Community Consultative Committee**

A combined Community Consultative Committee (CCC) operates for the Underground and Surface Operations.

The purpose of the CCC is to provide a forum for open discussion between Bulga Complex representatives, the community, the Council and other stakeholders on issues directly relating to the mine's operations and environmental performance, and to keep the community informed on these matters. The Bulga Complex hosted two CCC meetings in 2010 on 21 May and 3 December 2010. The CCC meetings included representatives from the community, Singleton Shire Council, DII and the Bulga Complex.

### **Face to face community stakeholder engagement program**

The Bulga Complex undertook face to face consultation with 75 of our neighbours and community members throughout 2010. Community issues relating to the underground and surface operations were discussed during the consultation. This program builds strong relationships with our neighbours and assists us to understand key issues of concern and provides opportunity for discussion.

### **Newsletters, advertisements, websites**

The Bulga complex provides the community with information via its newsletter, websites and monthly advertisements in the Cockfighter newsletter.

The Bulga Complex News is a bi-annual newsletter that is distributed to our stakeholders. The January and August editions in 2010 included a reply paid feedback form that gave community members the option to provide feedback or request consultation. The topics covered issues of interest include noise and gas drainage updates.

Beltana and Bulga Coal have websites where members of the community can access information and the latest reports, including environmental monitoring data.

The Bulga Complex advertises contact details for the Environment and Community staff in the local Cockfighter newsletter which was distributed monthly to mailboxes of residents in Broke, Bulga and Milbrodale in 2010.

### **Broke Village Fair**

The Bulga Complex has been a major sponsor of the Broke Fair for a number of years. In 2010 the Bulga Complex provided financial and marketing support to the Broke Fair Committee. On the day of the Fair, staff from the Surface and Underground Operations manned an information tent, where native trees and helium balloons were given away. Mine tours of the Surface Operations were also provided to fair patrons with 7 tours conducted during the day.

### **Broke Village Fair Committee**

The Bulga Complex was represented at the Fair Committee meetings in 2010, showing our continued support for this popular community event.

#### **4.2.1 Donations**

The Bulga Complex contributed over \$70,000 to schools, community groups and charities in 2010, making a positive difference by providing much needed financial support to these community and charitable organisations.

Recipients of donations:

- Variety's Newcastle Bush Bash;
- Broke Hall - contribution towards turfing the lawn;
- Special Children's Christmas Party;
- Cancer Council;
- MS Society – Sydney to Gong Bike Ride;
- Broke Public School - swimming lessons and buses during December Swim School;
- Singleton Scouts;
- YMCA Murray Marathon;
- Cancer Council - Cessnock Relay for Life;
- St Catherine's - School Fete;
- Wildlife Aid;
- Cystic Fibrosis - Great Escape Rally;
- Kids Foundation;
- Wayne Gardiner - local woodturner raising money for Children's Cancer Institute of Australia; and
- Witmore Enterprises – purchase of a safety saw.

#### **4.2.2 Community Project and Sponsorships**

##### **Language Development Partnership, Broke Public School**

In 2010, the Bulga Complex entered an innovative 3 year sponsorship of a learning program, 'Language Development Partnership' with the Broke Public School. This sponsorship also includes the funding of a Teacher Aide for an additional day per week to help implement the program. All students with learning difficulties experience some form of language processing difficulty (either expressive or receptive

language). The Language Development Partnership involves a speech pathologist whose expertise is in language and language processing, working with teachers on strategies to assist students with these issues.

### **Teaching and Keeping Place, Singleton**

In 2009 Xstrata Coal pledged \$600,000 to the establishment of a Teaching and Keeping Place. Working with the local aboriginal community to progress the Teaching and Keeping Place project, the Bulga Coal Complex facilitated 7 committee meetings in 2010. The committee meetings have focused on gaining access to a site, establishment of an entity and cultural aspects.

### **History of Broke**

The Bulga Complex engaged Hunter History Consultants to research and write the history of Broke from Pre-European through to today. During 2010, local residents whose families have lived in the area since settlement were interviewed by the historians. Their stories, memories and photographs will be incorporated into the history book which will be available to every community member upon completion.

### **Sponsorships**

The Bulga Complex was proud to sponsor the following community projects and events, from the Village Fair that draws 8,000 visitors to the sleepy village of Broke to the popular campdraft competition.

Organisations and events that were sponsored:

- Broke Fair Committee - *Broke Village Fair and Vintage Car Display;*
- Broke Fordwich Wine and Tourism Association - *Little Bit of Italy Festival, Spirit of the Vine;*
- Singleton Beef and Land Management - *Junior Cattle Judging Competition;*
- Broke Public School - *Language Development Partnership;*
- Branxton Campdraft - *Novice and Junior categories;*
- Broke Public School P&C - *Art in the Vines;*
- Singleton Tidy Towns - *Adopt-a-Spot Clean Up, Broke Road; and*
- Singleton Public Library - *Summer Reading Program.*

## **4.3 Community Feedback**

The Bulga Complex receives both formal and informal feedback from the community about our consultation program and environmental performance. Formal methods include the community feedback form which is distributed with the community newsletter biannually, and asks for feedback regarding our mining operations, community support program, and preferred method of consultation. In 2010, 6 community feedback forms were returned to the Bulga Complex from the January and July newsletter editions, letterboxed dropped to around 500 community members and stakeholders throughout Broke and Bulga.

The community barbeque program also provides opportunity for community members to provide feedback regarding our operations via a Request for Consultation Form. In 2010, 2 community barbeques were held. There were no forms filled out at either of the community barbeques, however a number of issues were raised with staff present at the barbeques. Feedback is also gained through face to face consultations and other interactions with the community.

Reviewing both the formal and informal feedback in 2010, noise, dust, blast fume and future development of the surface and underground operations were noted as community issues. As a result, further work is being undertaken to improve noise and dust management. Further research into blast fume is also being undertaken. An update on these issues will be provided in future community newsletters, community barbeque program and CCC meetings.

There was also positive feedback from the community regarding our community consultation program, and the continuing improvements to management of noise.

## 5.0 REHABILITATION

Progressive rehabilitation of disturbed areas is an important aspect of the mining operations at the Bulga Coal Complex. The objective of this rehabilitation is to restore the land to a condition that is equal or greater to that prior to disturbance. Ongoing rehabilitation of areas disturbed by operations has continued throughout the reporting period. Quarterly rehabilitation inspections and an annual rehabilitation inspection were undertaken by the rehabilitation contractors GSSE throughout the reporting period to monitor the success of rehabilitation works. Regular informal monitoring of the sites is conducted by Bulga Coal Complex environmental staff during site inspections. All rehabilitation works are reported within the overall context of the operations of the Bulga Coal Complex. The outcomes of the GSSE quarterly and annual rehabilitation reports are summarised below.

### 5.1 Buildings

There were no buildings removed during the reporting period, and only minor renovation activity.

At the commencement of Blakefield South Longwall 1, one house and two open sheds were located within the subsidence zone. Structural inspections were undertaken for these buildings prior to, during and following subsidence associated with the extraction of Blakefield South Longwall 1. Damage repairs were completed as necessary. Repairs were conducted on a windowsill of the property by the Mine Subsidence Board.

### 5.2 Rehabilitation of Disturbed Land

#### 5.2.1 Rehabilitation Summary

Rehabilitation activities undertaken during the reporting period at the Bulga Coal Complex have been completed in accordance with the Surface Operations MOP (Umwelt 2006) and the Underground Operations MOP (2007);

- Overburden dumps are battered down to between 8 – 10° to facilitate ground preparation, seeding and to minimise erosion impacts. Permission has been obtained from the Inspectorate Division of the DPI to permit profiling of the Blakefield South and the Blakefield North up to 14°;
- Contour drains and stock dams are installed along with toe drains and silt trap dams;
- Slope lengths are limited to between 50 – 70 metres;
- Where topsoil is available, it is spread at a maximum of 150 millimetres thick over shaped overburden areas (usually the gypsum is added after the topsoil is spread because of the high clay content in the topsoil);
- Biosolids are used to supplement the application of topsoil, where suitable;
- In areas allocated for tree lots, deep ripping occurs along the contours over the entire area. For grass areas, the surface is ripped and rock – raked to remove any rocks at the surface;
- The ground is selectively treated with gypsum at the rate of 10t/ha to combat the high clay content and to prevent surface sealing, thus enabling water penetration into the overburden;
- After gypsum application, the area is then deep ripped on the contour. Any large rocks brought to the surface are raked aside and then removed, used in spillways and drains or are sometimes reburied;
- The area is then seeded and fertilised;
- In the event that native tree species are being direct seeded in areas that have been spread with topsoil, the use of fertiliser is avoided to reduce the potential for weed infestation and subsequent competition for young germinants;

- Where possible salvaged features such as logs and hollows are placed within the rehabilitation area to aid with habitat creation; and
- A mixture of seasonal cover crop and various native tree and understorey species seed is directly sown by broadcasting. Local provenance species are sown where available. The tree species are directly seeded (at a rate of around 7kg/ha) along with grass species. Lists of the seedling species and tree seeding species used in rehabilitation have been outlined in **Table 5.6**.

**Tables 5.1 and 5.2** presents summaries of the rehabilitation achievements and maintenance undertaken during the reporting period.







**Table 5.1 Summary of Rehabilitation at the Surface Operations**

		Area (Ha) last report Dec 2009	Area (Ha) to date Dec 2010	Area (Ha) expected 2011
A	<b>MINE LEASE AREA</b>			
A1	Mine Lease(s) Area	4269	4269	4269
B	<b>DISTURBED AREAS</b>			
B1	Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	140	100	100
B2	Active Mining Area (excluding items B3 – B5 below)	385	405.7	413.6
B3	Waste emplacements (active/unshaped/in or out-of- pit)	393	766.7	766.7
B4	Tailings emplacements (active/unshaped/uncapped)	119	142.8	142.8
B5	Shaped waste emplacements (awaits final vegetation)	Nil	Nil	Nil
	<b>ALL DISTURBED AREAS</b>	960.5	1415.2	1423.1
C	<b>REHABILITATION</b>			
C1	Total rehabilitated area	847	592.6	603.6
D	<b>REHABILITATION OF SLOPES</b>			
D1	10 – 18 degrees	69.2	147.7	152.7
D2	Greater than 18 degrees	Nil	131.2	131.2
E	<b>SURFACE OF REHABILITATED LAND</b>			
E1	Pasture and grasses	578	480.8	491.8
E2	Native forests/ecosystems	335	111.8	111.8
E3	Plantations and crops	Nil	Nil	Nil
E4	Other (including non- vegetative outcomes)	Nil	Nil	Nil

Table 5.2 Summary of Rehabilitation at the Underground Operations

		Area (Ha) last report Dec 2009	Area (Ha) to date Dec 2010	Area (Ha) expected 2011
A	<b>MINE LEASE AREA</b>			
A1	Mine Lease(s) Area	4269	4269	4269
B	<b>DISTURBED AREAS</b>			
B1	Infrastructure area (other disturbed areas to be rehabilitated at closure including facilities, roads)	116.6	144.4	188.8
B2	Active Mining Area (excluding items B3 – B5 below)	Nil	Nil	Nil
B3	Waste emplacements (active/unshaped/in or out-of- pit)	Nil	Nil	Nil
B4	Tailings emplacements (active/unshaped/uncapped)	Nil	Nil	Nil
B5	Shaped waste emplacements (awaits final vegetation)	Nil	Nil	Nil
	<b>ALL DISTURBED AREAS</b>	116.6	144.4	154.3
C	<b>REHABILITATION</b>			
C1	Total rehabilitated area	81.2	102.0	111.9
D	<b>REHABILITATION OF SLOPES</b>			
D1	10 – 18 degrees	Nil	Nil	Nil
D2	Greater than 18 degrees	Nil	Nil	Nil
E	<b>SURFACE OF REHABILITATED LAND</b>			
E1	Pasture and grasses	40.4	50.8	55.5
E2	Native forests/ecosystems	40.8	51.2	56.4
E3	Plantations and crops	Nil	Nil	Nil
E4	Other (including non- vegetative outcomes)	Nil	Nil	Nil

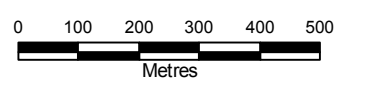
# Figure 5.1a TOTAL DISTURBANCE AND REHABILITATION (BELTANA)

-  Beltana Mine Workings
-  Subsidence Repairs
-  Road
-  Area Undermined
-  Disturbed
-  Seeded

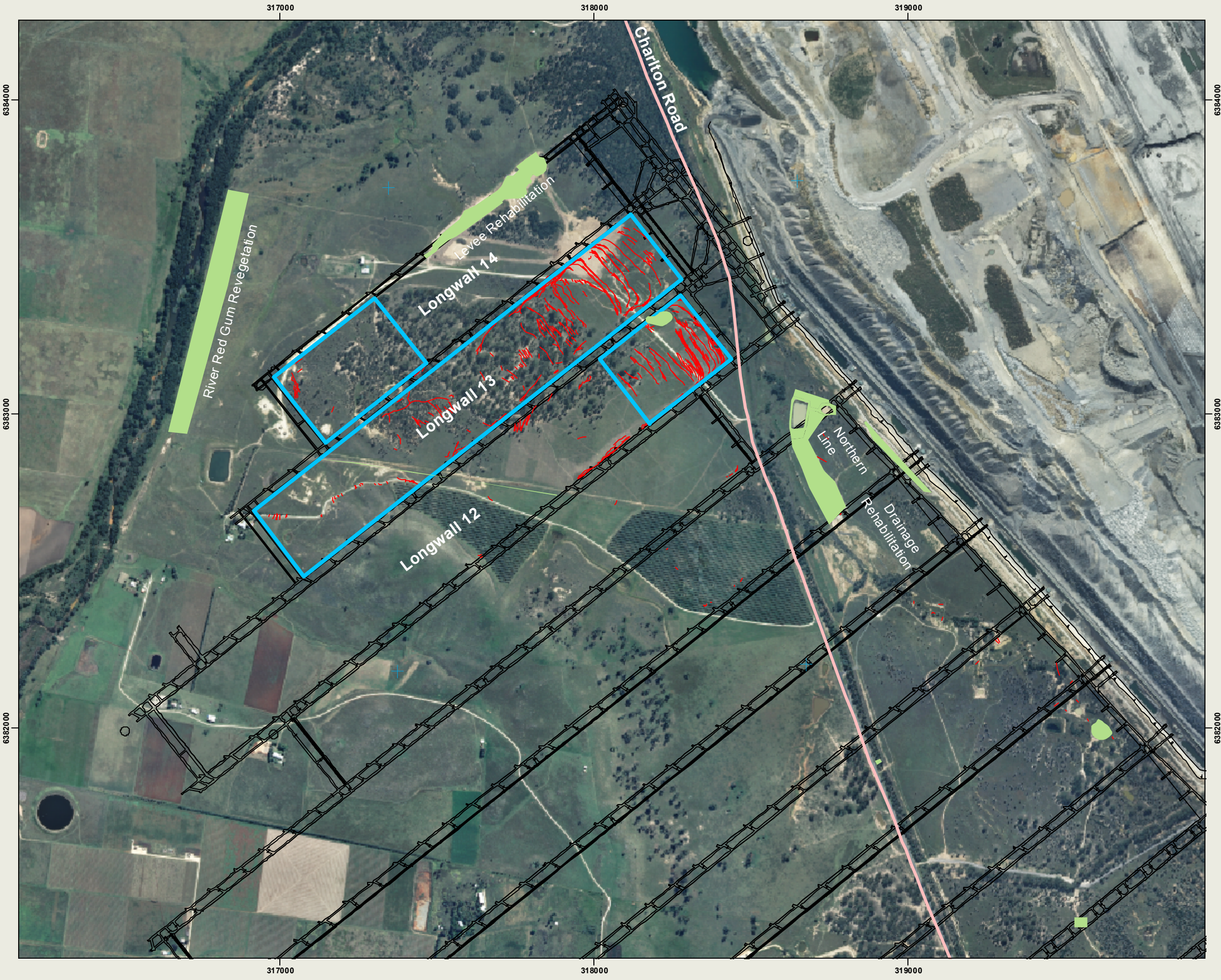


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







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# Figure 5.1b

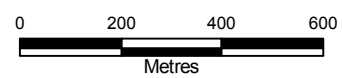
# TOTAL DISTURBANCE AND REHABILITATION (BLAKEFIELD)

-  Blakefield Mine Workings
-  Subsidence Repairs
-  Road
-  Area Undermined
-  Disturbed
-  Seeded

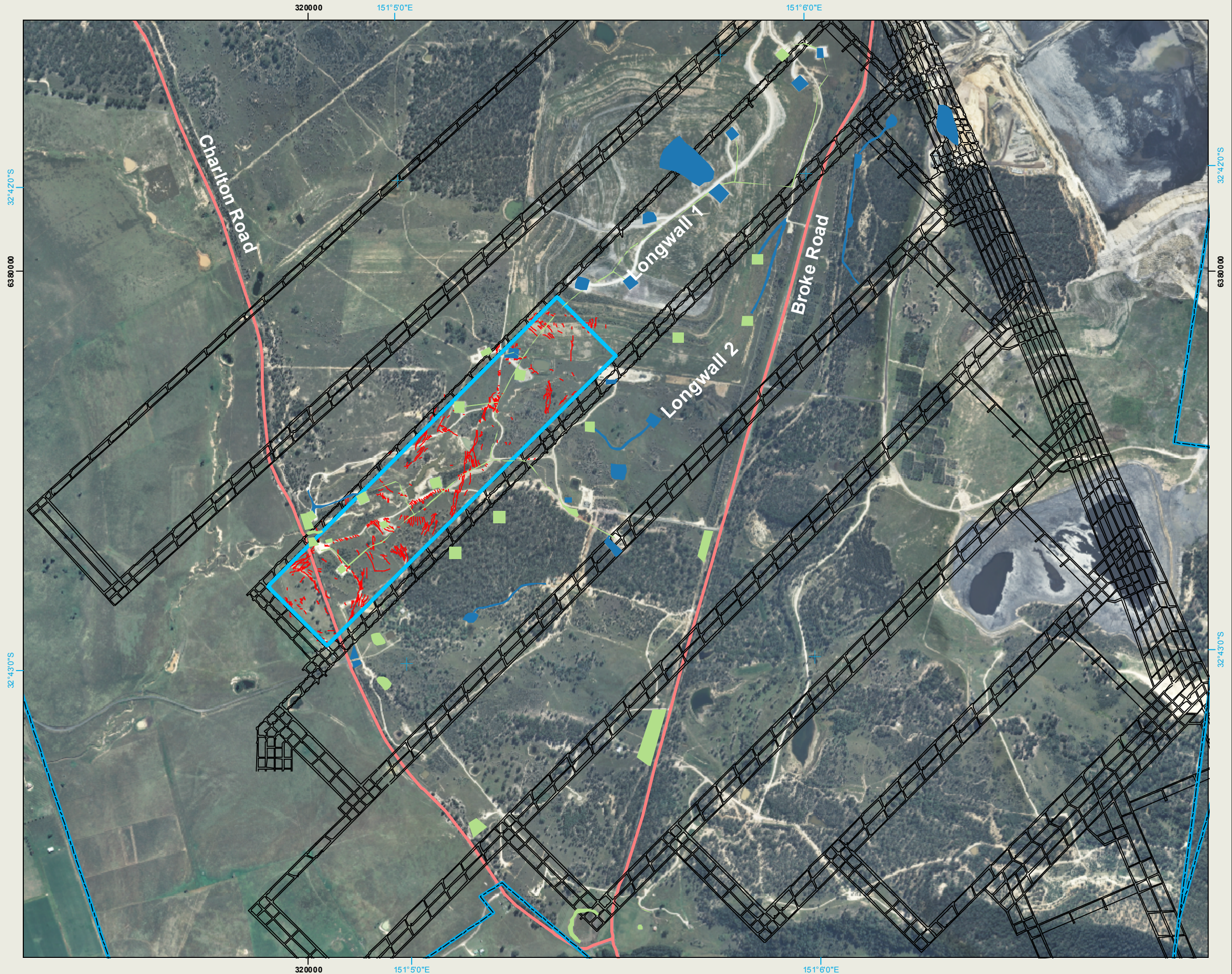


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 Coordinate System: MGA (GDA 94) Zone 56



In addition to new rehabilitation works, maintenance activities that were undertaken on rehabilitated land have been summarised below in **Tables 5.3** and **5.4**.

**Table 5.3 Maintenance Activities on Rehabilitated Land for Surface Operations**

Nature of Treatment	Area Treated (hectares)		Comment/control strategies/treatment details
	2010	2011	
Additional erosion control works (drains re-contouring, rock protection)	2	5	Repairs and stabilisation works completed on the SB drop structure and adjacent contour banks.
Re-covering (further topsoil, subsoil sealing etc.)	8	0	Re-profiling steep area of the NB dump, installation of contour banks, ameliorant application and seeding.
Soil treatment (fertiliser, lime, gypsum etc.)	7	20	Re-profiling steep area of the NB dump, installation of contour banks, ameliorant application (gypsum and fertilizer).
Treatment/management (grazing, cropping, slashing etc.)	0	10	No grazing, cropping or slashing was undertaken in 2010.
Re-seeding/replanting (species density, season etc.)	0	15	No Re-seeding/replanting was undertaken
Adversely affected by weeds (type and treatment)	8	15	Weed management activities concentrated on the scraping Galenia on the NB dump.
Feral animal control (additional fencing, trapping, baiting etc.)	15	As required	Feral animal control concentrated on wild dog control using baiting.

**Table 5.4 Maintenance Activities on Rehabilitated Land for Underground Operations**

Nature of Treatment	Area Treated (hectares)		Comment/control strategies/treatment details
	2010	2011	
Additional erosion control works (drains re-contouring, rock protection)	5.5	12	Northern Drainage Line and Southern Drainage Line mitigatory works, with minor erosion and sediment control associated with gas drainage and other mining operations.
Re-covering (further topsoil, subsoil sealing etc)	2	5.2	Infilling of subsidence cracks with sand, topsoil and clay at Blakefield South and Beltana, particularly in shallow depths of cover at Beltana.
Soil treatment (fertiliser, lime, gypsum etc.)	Nil	Nil	
Treatment/Management (grazing, cropping, slashing etc)	15	15	Slashing undertaken along Broke and Charlton Road verges and at the intersection of Broke and Charlton Road, near the old dairy. 10 Ha of millet/forage sorghum sown on Halkin Estate.
Re-seeding/Replanting (species density, season etc)	15.8	22.3	Seeding around goaf wells and on pipelines, Northern Drainage Line rehabilitation, River Red Gum replanting and tree screening.
Adversely Affected by Weeds (type and treatment)	15	20	Targeted galenia on disturbed areas and road verges by spot and boom spraying, and blackberry along watercourse and dam verges by spot spraying. 2011 program to continue targeting galenia and blackberry, along with prickly pear, yellow lantana and pampas grass by spot and boom spraying, and occasional removal of woody established species.
Feral animal control (additional fencing, trapping, baiting etc)	-	-	Feral pig trapping program continued in 2010 and will continue in 2011.

During 2010 a detailed inspection program was undertaken to determine future maintenance requirements for the Bulga Coal Complex. This inspection was used to develop the 2011 Annual Rehabilitation Plan with specific budget allocation for maintenance works.

### 5.2.2 Post Rehabilitation Land use and Capability

Rehabilitation during the reporting period has continued to focus on the restoration of topography and revegetation of the site. Restoration aims to create a suitable landform that would sustain grazing land and forested areas. For the land to effectively support grazing activities, land disturbed by mining operations needs to be restored to Class VI rural land capability classification (grazing). Class VI land is suitable for grazing although it is not suitable for cultivation. Soil conservation practices include minimising stock numbers, limiting stock access, broadcasting seed and fertiliser, preventing fire and destroying vermin. Some isolated structural works may be required to achieve this rural land capability classification.

Although mining operations at the Bulga Coal Complex will result in a loss of some Class V and VI land within the area, a range of forested areas will be established within the rehabilitated areas. These areas will offset the loss of Class V and VI through creation of habitat for native fauna (see **Section 3.10**).

The final landform would include a drainage pattern that is capable of conveying runoff from newly created catchments, whilst minimising the risk of erosion and sedimentation. Drainage characteristics for the site have been developed in accordance with the Draft Guidelines for Designing Stable Drainage Lines on Rehabilitated Sites (DLWC, 1999). The system integrates surface storage during periods of high rainfall runoff and manages deep infiltration to levels which can be safely tolerated. The system has also been designed to reduce the size of the surface drainage system.

### 5.2.3 Details of Emplaced Waste Materials

Despite the apparent unsuitability of overburden, the application of gypsum (to prevent surface sealing) and NPK fertiliser in the past have proved to be successful ameliorants to allow both trees and pastures to be established and maintained. This treatment process has been continued in rehabilitation activities undertaken throughout this reporting period.

The MOP identified no stratum within the coal measures with demonstrated chemical properties that would potentially hinder plant growth in areas of rehabilitation (Umwelt 2006). More suitable siltstone, mudstone, friable sandstone and soils are used to bury any massive sandstone or claystone to further promote vegetation.

Additionally, any material that is not appropriate is handled in such a way that it is buried and not exposed. This requires ongoing development of a better understanding of overburden and rejects material on specific characteristics, such as potential for spontaneous combustion, PAF, salinity, sodicity and metals.

Bulga Coal has four soil types located onsite. **Table 5.5** below shows the results of overburden sampling undertaken during the reporting period.

**Table 5.5 Overburden Characteristics**

Soil Code	Organic C (%)	EC (dS/m)	pH	P (ppm)	K (ppm)	N (ppm)
BU2	0.6	0.3	9.61	120	232	1023
BU3	0.5	0.45	9.47	50	429	915
BU4	0.4	0.24	9.63	170	607	1062
BU5	0.4	1.41	8.94	520	240	898

## 5.2.4 Cover Material

Stripping operations during the reporting period were conducted in accordance with stripping plans of 10 – 20cm of recommended stripping depth and in situ soil conditions. Previous assessments have indicated that the Surface Operations have a significant topsoil deficit. As the lack of topsoil does not affect the establishment of trees, the shortage of topsoil at the Bulga Coal Complex is not critical to the overall success of future rehabilitation works.

The Surface Operations has approximately 300,000m<sup>3</sup> of topsoil in various topsoil stockpile locations area around the site. This is well below the topsoil requirement of approximately 640,000m<sup>3</sup>. The surface operations have integrated the use of recycled organics, including biosolids and compost, in place of topsoil to provide a suitable medium for plant growth on overburden. Biosolids and compost are applied at a rate of 100 dry tonnes per hectare. In some areas a thin layer of topsoil has been combined with biosolid application to improve long term vegetation results.

## 5.2.5 Surface Operations Rehabilitation Progress

In 2010 40 Hectares of pasture mix was sown in Q3 utilising two ameliorant treatments (5ha topsoil and 35ha compost). The pasture mix, as detailed below consisted of cover crop species, annual and perennials. A promising strike has been observed with the September seeding with constant light rainfall in the weeks following completion.

**Plate 5.1** shows the Ramp 12 rehabilitation completed in 2010. The foreground showing germination of the cover crop which was seeded in late September. The remaining area shown in the plate was seeded in December and as of early January minimal germination was observed.



**Plate 5.1 – Ramp 12 Rehabilitation**

During the reporting period, rehabilitation sites in the Bulga Surface were situated within the North Blakefield, and South Blakefield waste dumps. The woodland sites on the waste emplacements generally contained soils that had elevated pH, elevated electrical conductivity, nutrient deficient, sodic and experienced some minor rilling. The sites were still relatively immature although they were generally associated with healthy levels of ground cover and sites were stabilising. Galenia was beginning to colonise some parts of the slopes, particularly where the soils lacked good ground cover.

The rehabilitation areas associated with the Surface Operations were still undergoing development during the reporting period and therefore, did not yet meet many of the proposed ecological targets, although the older site NB3 performed relatively well. All sites are still relatively immature and this is expected to be associated with the rehabilitation areas being unable to yet meet the very high 99% KPI target. Of the

pasture sites, NB2 was performing the least, as it had alkaline, sodic soils and excessive electrical conductivity values and was dominated by Galenia.

All rehabilitation at the Bulga Coal Complex includes the use of approved seeding species listed in **Table 5.6**. Whilst the majority of the complex uses a consistent seeding mixture, there are minor differences between Surface and Underground Operations. Furthermore, specific seeding mixes are used for a variety of slope types.

All sites were generally comprised of an appropriate number of tree and shrub species that met several structural and habitat targets, although non endemic species were present. The understorey was generally dominated by exotic species with native species present in pockets. These areas of native vegetation had established from the topsoil seed bank. In most cases the trees and shrubs were healthy. Smaller bare scalded areas were also observed in parts of the north and south Blakefield emplacements and would benefit from the application of local native pasture mulch.

**Table 5.6 Seeding Species**

Tree	<i>C. maculata</i> (Spotted gum), <i>E. camaldulensis</i> (River red gum), <i>E. moluccana</i> (Grey box), <i>E. albens</i> (White box), <i>E. punctata</i> (Grey gum), <i>E. fibrosa</i> (Broad leaf ironbark), <i>E. crebra</i> (Narrow leaf ironbark), <i>A. falcata</i> (Sickle leaf wattle), <i>A. decurrens</i> (Green wattle), <i>A. implexa</i> (Lightwood), <i>A. decora</i> (Western silver wattle), <i>A. longifolia</i> (Golden wattle), <i>A. filicifolia</i> (Ferny leaved wattle), <i>D. viscosa</i> (Hopbush), <i>P. spinosa</i> (Spiny bush pea), <i>A. buxifolia</i> , <i>A. mearnsii</i> , <i>C. rigidus</i> , <i>C. cunninghamiana</i> , <i>E. sideroxylon</i> , <i>E. tereticornis</i> , <i>M. styphelioides</i> , <i>K. ambigua</i> , <i>L. longifolia</i> , <i>C. pinifolius</i> , <i>D. ulicifolia</i> , <i>H. violacea</i> , <i>B. spinosa</i> .
Pasture	Green Panic, Spear Grass, Kangaroo Grass, Couch, Lucerne, Seaton Park Clover, Wimmera Rye, Perennial Rye, Sephi Barrel Medic, Kikuyu, Phalaris, Oats (Winter mix), Jap Millet (Summer mix), Bulking agent: Granulock 15.
Cover Crop	Oats (autumn/winter) or Japanese Millet (spring/summer), Tertilla Rye Grass, Rye Corn, Red Clover.

The pasture rehabilitation areas were largely dominated by a dense rank sward of exotic pasture species such as *Chloris gayana* (Rhodes Grass) and generally had low floristic diversity dominated by exotic species, including Galenia. However, it should be noted that surveys were undertaken after a long drought period and during winter, which naturally reduces active plant growth. Seasonal annual plants are generally absent during this time of year.

The soils of the pasture rehabilitation areas typically had elevated pH, elevated electrical conductivity, were nutrient deficient, sodic and generally experienced minor rilling.

## 5.2.6 Underground Operations Rehabilitation Progress

### Tree Screening

Tree screen planting was conducted at selected locations along Broke and Charlton Road for the purpose of screening existing and future gas drainage infrastructure and other mining related activities. A combination of direct seeding and tubestock was used. All sites have shown initial success over the course of the reporting period.

### River Red Gum Ecological Community Restoration Project

The Stage 2 Restoration Project aims to re-establish the endangered River Red Gum Ecological Community on mine owned land. Stage 2 was conducted following the observed initial success of the first plantings, with both stages progressing towards the correct ecological parameters for the Hunter Floodplain River Red Gum Woodland community classification. Stage 2 consisted of the completion of planting tubestock. Stage 3 and 4 are planned for 2011 to supplement the existing stages and to promote habitat connectivity.

### Wet Soak Planting

Two soaks near the Broke Road and Charlton Road intersection were planted with tubestock riparian species. The aim of the planting is to replicate natural wetland communities and contribute to habitat recovery/connectivity. The larger of the two soaks, located west of Broke Road was planted first with approximately 300 tubestock species using a Hamilton planter. This soak is showing strong initial success. The smaller soak, which is adjacent to the old dairy, has shown limited success recently as the soak area significantly decreased following a prolonged period of hot dry weather. Both stages are progressing towards the correct ecological parameters for the Closed Melaleuca Forest community classification, which included the species listed below:

- *Casurina glauca*;
- *Melaleuca linariifolia*;
- *Melaleuca stypheloides*;
- *Melaleuca ericifolia*;
- *Callistemon linearis*;
- *Lomandra longifolia*; and
- *Leptospermum laevagatum*.

### Northern Drainage Line Restoration Project (Stage 1 & 2)

The Northern Drainage Line (NDL) Restoration Project aims to re-establish vegetation and stabilise the landscape following the undermining and subsidence of the area from the Beltana workings. Both stages are showing strong initial success, with a mixture of riparian and woodland species establishing and progressing towards the correct ecological parameters for the Central Hunter Riparian Forest / Red Gum Woodland Complex community classification. Final rehabilitation will take place in 2011 following the completion of Beltana Longwall 14 extraction and final Whybrow subsidence.

### Pipeline Rehabilitation

Pipelines were laid connecting goaf wells on Longwall 1 to the central gas flaring facility, creating a disturbance area of approximately 1.52ha. All pipelines have been rehabilitated during the reporting period, which involved lightly tilling the earthen bund covering the pipeline and spreading pasture seed mix. Due to the amount of pipelines laid out during the reporting period (and proposed for future underground mining at the Bulga Coal Complex) a Pipeline Rehabilitation Procedure was developed and implemented to standardise the rehabilitation process. **Plate 5.2** shows a pipeline near Broke and Charlton Road that has been seeded and spread with hay to encourage germination and surface cover on disturbed areas. **Plate 5.3** shows the same location at a later date with observed successful seed germination and stabilisation of the disturbed area.



**Plate 5.2 – Before Seed Mix Application**



**Plate 5.3 – After Seed Mix Application**

### **5.2.7 Erosion, Contamination and Pollution Risks**

Rehabilitation activities were undertaken in accordance with the MOP to mitigate any erosion, contamination and pollution risks. The detection of erosion triggered a response, as required by the Erosion and Sediment Control Plan. Issues regarding contamination prevention and pollution risks are detailed in **Section 2.1** and **2.2**.

### **5.2.8 Safety Risks**

BCM has implemented a security system to ensure public and employee safety is maintained during all aspects of the operation. These systems and procedures have been established in accordance with the relevant requirements under the *Coal Mines Regulation Act 1982*, *Occupation Health and Safety Act 1983*, *Mining Act 1992* and conditions stipulated in the relevant site specific approvals, licences and leases.

All contractors and employees working on site are inducted in mine safety and environmental management issues prior to working within the mine area. This includes specific instruction and awareness based on rehabilitation activity. Additionally, a multi-work permit must be completed prior to commencement of work and an environment and community risk assessment must be undertaken to identify any potential risks associated with the rehabilitation works.

For further information regarding public safety refer to **Section 3.18**, which provides control strategies for the public safety issues of the site, including rehabilitation areas.

### **5.2.9 Fences and Other Barriers**

Over the course of the reporting period fencing and barriers have been utilised for the following purposes:

#### **Access Restriction**

Fences and barriers, including the construction of engineered barriers or bunds, have been developed in rehabilitation areas as per public safety requirements. The site has been fenced to prevent direct access from public roads. The area is secured with locked gates when there is no activity occurring.

#### **Erosion and Sediment Control**

Erection of temporary silt fences within drainage lines have been installed to promote deposition of any sediment and detention of runoff. Inspections are undertaken to identify the need or otherwise for maintenance of other sediment fences and sediment control structures.

## **5.3 Rehabilitation Trials and Research**

During the 2010 reporting period, the Bulga Coal Complex implemented a number of rehabilitation trials. A summary of these rehabilitation trials is provided below.

### **5.3.1 Topsoil Nutrient Enhancement**

During the reporting period, the Surface Operations initiated a new rehabilitation trial relating to the use of recycled organic matter (compost) to supplement and/or replace the nutrient deficient topsoil found onsite.

The trial was completed in two stages; with the first being a small pot trial (10m x 2m) comparing pastures response (topsoil/compost/mushroom compost/topsoil, compost mix). Further variables associated with the rehabilitation methodology were standard across all treatments. From the qualitative results observed, the compost performed best in terms of growth rate, cover percentage, and species diversity. Due to the increased cover percentage the weed incursion was lower in the compost as compared to other treatments.

The second stage of this trial was to implement these findings into the wider rehabilitation program, as such we have utilised two variants of the compost on approximately 60% of the 2010 rehabilitation. The remaining 40% utilised topsoil so that direct comparisons can be made. Early promising strike on the 2010 rehabilitation displays a preference for compost, however, further growth is required to determine a definitive outcome of the trial.

### **5.3.2 Ramp 12 Rehabilitation Area**

Bulga Coal Complex determined to complete the rehabilitation works in the Ramp 12 dump area following best practice principles due to the importance of this area for long-term stability of the final landform. GSSE were engaged to provide a detailed design that matched best practice expectation and also deviated from previous rehabilitation designs.

GSSE's designs were developed with the conceptual options for downstream water management in mind, to ensure the best long-term water management outcome for the site is achieved. The design of the water conveyance structures were undertaken using XP-RAFTS, a hydrological rainfall/runoff computer model used to predict peak flows and size water conveyance structures. The design parameters to be used were developed using a risk management approach. They adhere to current industry accepted practice and design guidelines along with a professional knowledge gained from completing similar projects at other sites.

The purpose of this structure is to convey runoff from the rehabilitated slope into a sediment dam for sediment control, promoting a stable landform.

This rehabilitation approach is considered a trial because it is the first of such type of design to be applied at Bulga. Success of this design will promote an application of the design for future rehabilitation areas. **Plate 5.4** shows Ramp 12 pasture seed as seen facing an easterly direction.



**Plate 5.4 – Ramp 12 Pasture Seed**

#### **5.4 Further Development of the Final Rehabilitation Plan**

As a requirement of Development Consent (DA41-03-99), Bulga is developing a revised Landscape Management Plan, incorporating the following components:

- Rehabilitation and Offset Management Plan;
- Final Void Management Plan; and
- Mine Closure Plan.

Bulga Coal is currently finalising this management plan and will make a submission to the Department of Planning by the end of March 2011. The Landscape Management Plan details the Mine Closure Planning processes in accordance with its development consent requirements and the Xstrata Coal's Mine Closure Standards. This plan will be made available to relevant departments for comment prior to finalising. The approved plan will be placed on the Bulga Surface Operations website.

Additional issues associated with the various rehabilitation areas and management recommendations that will assist in improving long-term rehabilitation outcomes, and ensure desired ecological targets will be met are briefly described below. The following recommendations have been incorporated in the Bulga Coal Complex Annual Rehabilitation Plan for 2011:

- Develop a long-term comprehensive rehabilitation management plan according to final land use objectives and best practice rehabilitation guidelines;
- Consideration of future management of the waste emplacements and surrounding buffer areas in terms of reducing fire risk and ongoing management strategies that aim to stimulate perennial vegetation;
- Consider strategic grazing as a useful tool to achieve these aims. It is acknowledged that this requires the appropriate knowledge, planning and infrastructure if it is to be accomplished successfully;
- Consider a seed collection and management program to establish a reliable source of endemic seed;

- Consider implementing methods to increase ground cover immediately following rehabilitation to limit the spread and potential invasion of weeds, and/or restrict the use of introduced pasture species to those that are non-invasive;
- Investigative the effectiveness of incorporating or utilising organic materials such as compost and biosolids;
- Undertake trials of locally harvested native pasture hay bearing mature seeds (which could be managed and sourced on-site) as a useful mulching treatment to determine what rate of application and in what spatial distribution better erosion control and native plant establishment can be obtained; and
- Make improvements to the weed and pest management program on rehabilitation areas.

## 6.0 ACTIVITIES PROPOSED FOR NEXT AEMR PERIOD

### 6.1 Underground

All activities proposed in the next AEMR period are consistent with the 2007 MOP. In accordance with DII Guidelines, a plan is required to be submitted with the AEMR that details the equivalent of MOP Plan 3, 4 and 5. This plan has been provided in **Appendix N**.

**Figure 6.1** illustrates the mining, rehabilitation, infrastructure construction and drilling proposed for 2011. It should be noted that the infrastructure proposed to be constructed on private property is subject to landholder consent that is yet to be confirmed.

During the next reporting period, the following works will be undertaken:

- Decommissioning the Beltana pit top facilities;
- Constructing the 9MW gas-fired power station;
- Management of the subsidence impacts of Beltana Longwall 14, and Blakefield South Longwall 1 & 2;
- Manage subsidence impacts to infrastructure along Broke and Charlton roads;
- Re-instating contour banks affected by subsidence on the Southern Extension Dump;
- Revegetation works along the Northern & Southern Drainage Lines;
- Tree-screening along Charlton Road;
- Stage 3 & 4 River Red Gum plantings;
- Pre-mining gas drainage facilities for Blakefield South Longwall 7 & 8; and
- Continued installation of post-mining gas drainage facilities and pipelines.

#### 6.1.1 Exploration and gas drainage drilling

Exploration drilling for the purposes of underground mine planning, proposed for 2011, is listed in **Table 6.1**.

**Table 6.1 Planned Underground Operations Drilling 2011**

ML	ID	Depth	Purpose
1547	SBR190	170m	Analysis of the Newcastle coal measures
1547	SBR186	352m	Mine design
1547	SBR187	550m	Mine design
1547	SBR188	439m	Mine design
1547	SBR189	180m	Inclinometer installation
1547	BExp01	470m	Resource definition
1547	BExp02	420m	Resource definition
1547	BExp03	465m	Resource definition
1547	BExp04	445m	Resource definition

ML	ID	Depth	Purpose
1547	BExp05	445m	Resource definition
1547	BExp06	400m	Resource definition
1547	BExp07	425m	Resource definition
1547	BExp08	480m	Resource definition
1547	BExp09	445m	Resource definition

The locations of proposed exploration drill holes are illustrated in **Figure 6.1**, additionally up to 27 new gas drainage wells are scheduled to be drilled in 2011.

## 6.2 Surface Operations

Mining operations during 2011 will be undertaken in the Bulga and Whybrow Pits. The areas to be mined during 2011 are illustrated in **Figure 6.2**. All Surface Operations activities proposed in the next AEMR period will be consistent with the MOP.

During the next reporting period, the following works are proposed to be undertaken:

- Construction of the XRail refuelling facility;
- Completion of the CHPP Surge Dam;
- Development and implementation of the Integrated Water Management System;
- Completion of the erosion and sediment control audit actions;
- Completion of the Hydrocarbon Remedial Action Plan;
- Completion of the EMS upgrade;
- Further visual screening of Whybrow spoils and Broke Road;
- Implementation of the Dust Improvement Program;
- Continued implementation of the Noise Reduction Program; and
- Completion of the Landscape Management Plan.

All activities proposed in the next AEMR period are consistent with the 2007 MOP. In accordance with DII Guidelines, a plan is required to be submitted with the AEMR that details the equivalent of MOP Plan 3, 4 and 5. This plan has been provided in **Appendix N**.

### 2011 Annual Rehabilitation Plan












In 2011 a total of 50 Hectares of primary rehabilitation and a total of 62 Hectares of Disturbance is planned. Rehabilitation activities will continue in the Ramp 12 area on the RL150 level and result in a joining of the North and South Blakefield dumps. It is expected that a mix of pasture and tree seed will be used. Water Management structures will be designed and constructed to create a self-draining, stable landform consistent with Bulga's MOP. Disturbance activities will occur ahead of mining in the North West corner of the mining operation. Clearing with consist of stripping topsoil from previously rehabilitated land, topsoil will be tested and ameliorated were possible for use on the rehabilitation.

In addition to the primary rehabilitation activities, a number of maintenance and visual mitigation projects are planned for 2011, these include:

- Contour failure repairs on North Blakefield Dump;

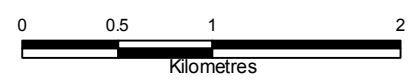
- Weed Management on North Blakefield Dump;
- Visual Mitigation works on the Whybrow spoils;
- Visual Screen along Broke Rd; and
- Reseeding drought affected areas on the Blakefield sumps.

# Figure 6.1 PROPOSED UNDERGROUND OPERATIONS 2011

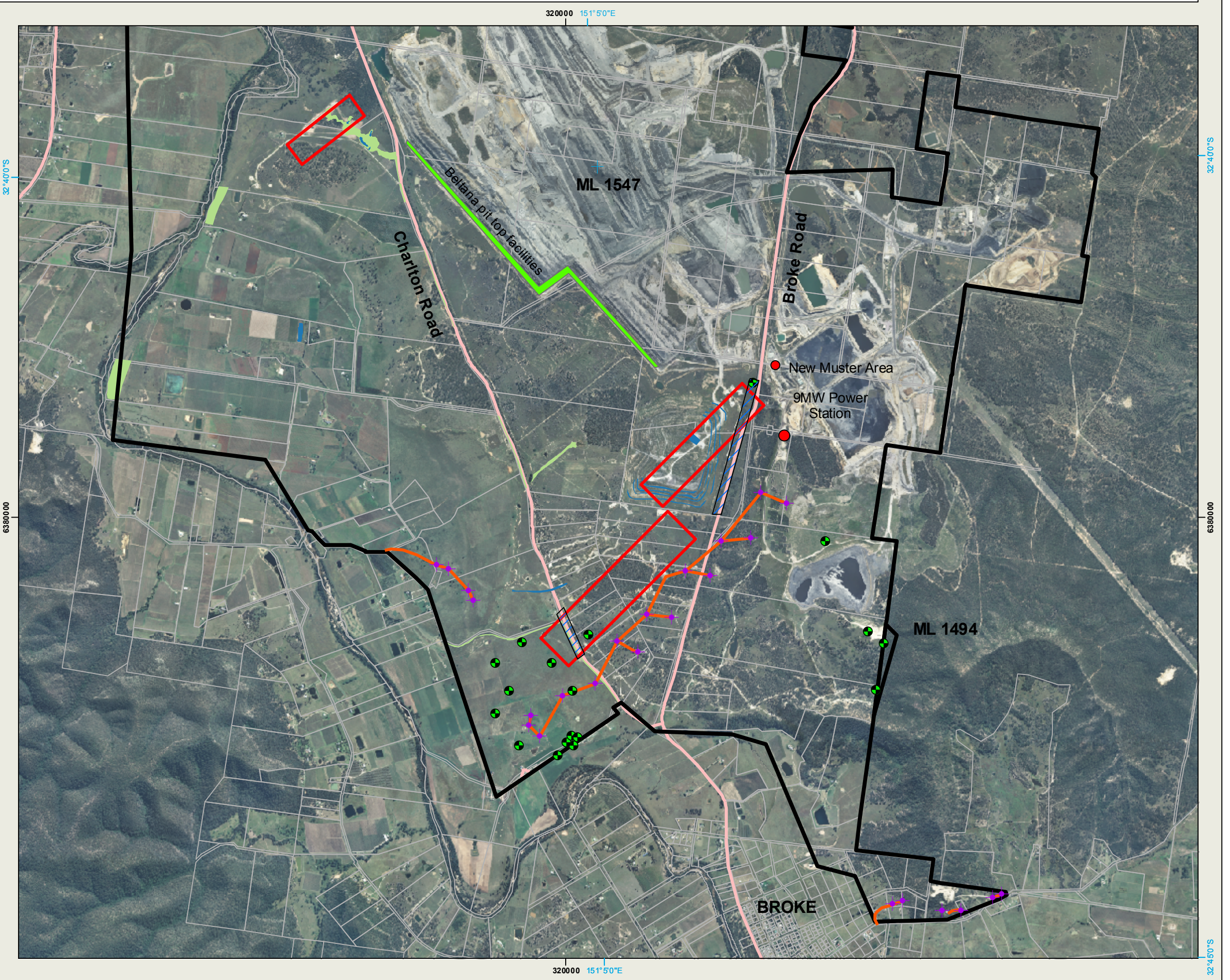
-  **MINING LEASES**
-  Road Subsidence Management Zone
-  Infrastructure Decommissioning
-  Exploration Borehole
-  Gas Drainage Borehole
-  Pipeline/Laneway
-  Longwall Extraction/ Subsidence Management Area
-  Levelling/Recontouring
-  Revegetation
-  Road
-  Cadastre

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# Figure 6.2 PROPOSED OPEN CUT OPERATIONS 2011

**MINING LEASES**

- Sub Lease

**Proposed 2011 Construction Activities**

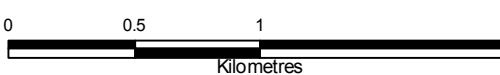
- 1) Administration Office Extension
- 2) Light Vehicle Wash Bay
- 3) Heavy Vehicle Wash Bay
- 2011 Exploration Drill Sites
- Proposed Disturbance
- Proposed Rehabilitation
- Proposed Weed Spraying
- Road
- Cadastre

**DISCLAIMER**

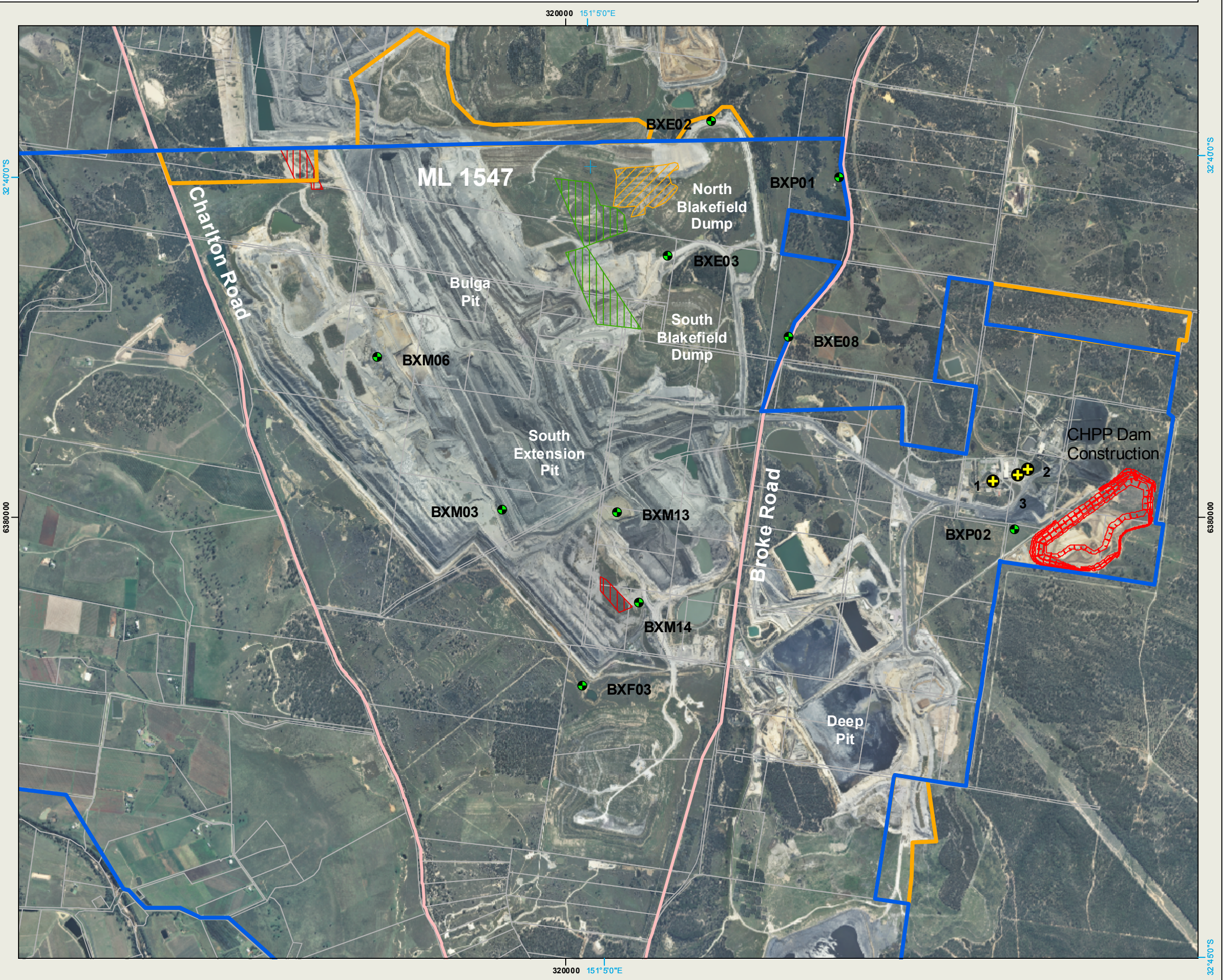
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## 7.0 REFERENCES

- Department of Environment, Water, Heritage and the Arts (DEWHA) 2008, National Greenhouse and Energy Reporting (Measurement) Determination 2008.
- Department of Environment, Water, Heritage and the Arts (DEWHA) 2006, AGO Factors and Methods Workbook.
- Department of Land and Water Conservation (DLWC) 1999. Draft Guidelines for Designing Stable Drainage Lines on Rehabilitated Sites.
- Department of Primary Industries (DPI) 2006. Guidelines to the Mining, Rehabilitation and Environmental Management Process.
- ERM Mitchell McCotter (ERM) 1999. Bulga Open Cut Mine Archaeological Assessment. Report to Bulga Coal Management Ltd.
- ERM Mitchell McCotter (ERM) 2001. South Bulga Colliery South-East Extension. Archaeological Assessment. Report to Bulga Coal Management Ltd.
- Heffernan, K. and Klaver, J 1997. A Comparative Assessment of Existing and Alternative Archaeological Zones, Bulga Mining Lease, Hunter Valley, NSW (Volume 1 and 2). A report to Bulga Coal Management.
- Koettig, M 1991. Survey and Test Excavations Bulga Lease Authorisation 219. Report to Saxonvale Coal Pty Ltd.
- MSEC 2010. MSEC435 Subsidence Monitoring Report.
- RPS 2011. 2010 Annual Ecological Monitoring Report.
- Umwelt 2002c. Bushfire Management Plan.
- Umwelt (Australia) Pty Limited 2003. Bulga Coal Continued Underground Operations: Aboriginal Heritage Assessment.
- Umwelt 2003. Bulga Coal Underground Operations Environmental Impact Statement.
- Umwelt 2003. Bulga Coal Continued Underground Operations Environmental Impact Statement.
- Umwelt 2006. Bulga Coal Management Mining Operation Plan.
- Umwelt (Australia) Pty Limited 2008. Annual Environmental Management Report.